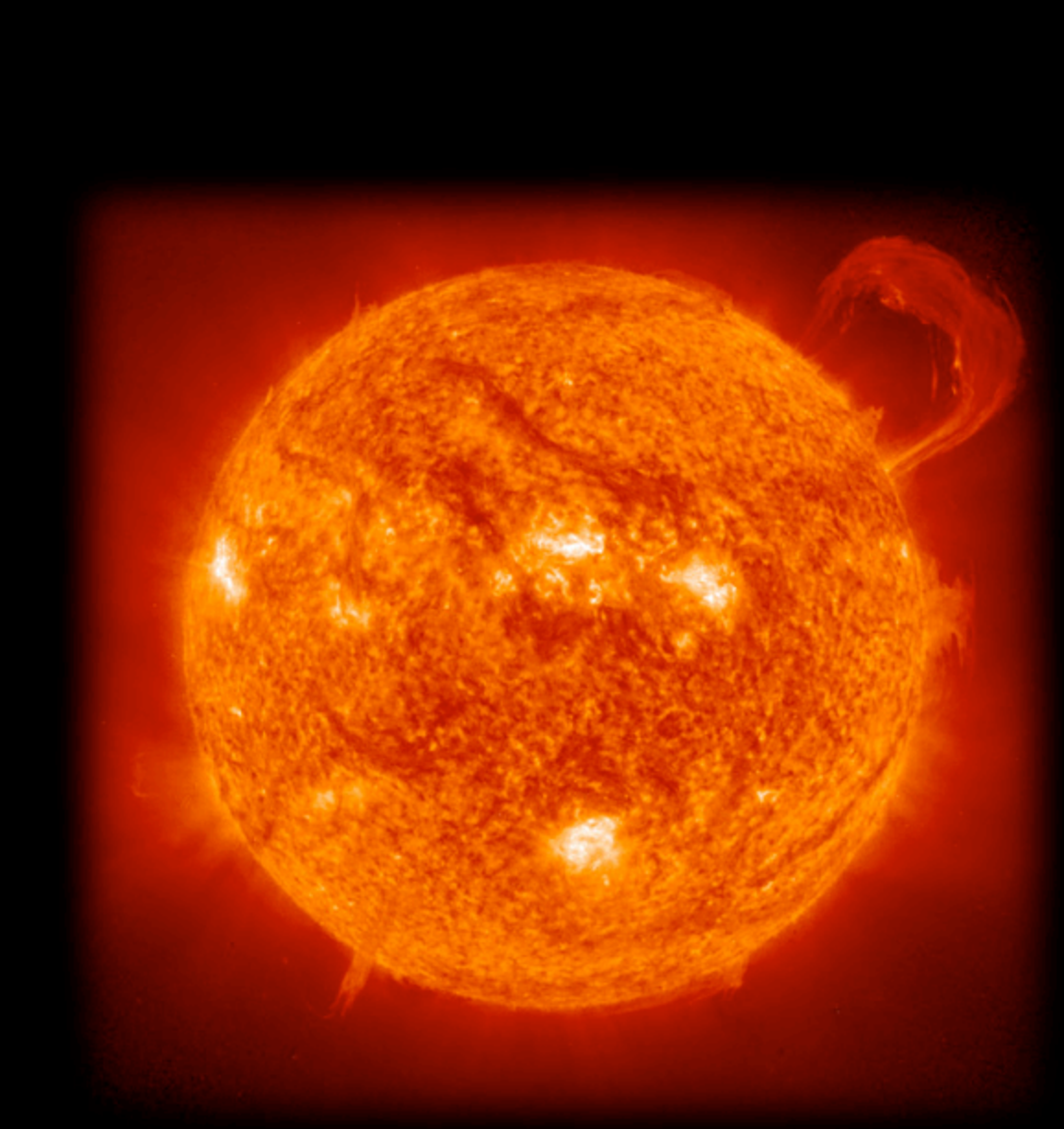


Using Radiance in an Integrated Design Process: Stantec Case Studies

Max Richter
Stantec Architecture

11 August 2005

Stantec

NEWS

Washington state could soon be on a different time than B.C.

The U.S. proposes to extend daylight saving time by two months

BY BRAD BADELT
VANCOUVER SUN

British Columbians might need to adjust their watches the next time they drive into Washington state.

On Tuesday, the U.S. Congress passed a provision to extend daylight saving time by two months as part of a sweeping national energy plan. The change is intended to curb energy use by cutting back on artificial lighting in the evening.

If U.S. President George W. Bush signs the bill, daylight saving time will begin the first weekend in March, instead of April, and run through to the last weekend in November, instead of October.

B.C. Energy Minister Richard Neufeld, who will oversee a provincial review on the issue, said there are pros and cons for following suit in B.C.

"If we were on a different peak [power consumption] hour than them [U.S.], that might help," Neufeld said Wednesday.

"But certainly the cons are that a lot of businesses and a lot of people would be inconvenienced by a time change in the Pacific Northwest."

Neufeld said he will work with other provinces, but not before reviewing how the change could impact B.C.

Proponents in the U.S. cited a government study that estimated energy savings of 100,000 barrels of oil a day, or one per cent of the daily U.S. consumption, with extended daylight saving time.

But Elisha Moreno, spokeswoman for BC Hydro, said a similar time change in B.C. would likely not have the same benefits.

"There is some indication that operating on daylight saving time year-round could produce some [energy] savings, but it was marginal," Moreno said, noting that energy-saving fixtures have already cut consumption in B.C.

Moreno also said extended daylight saving time would not affect energy consumption spikes, which typically happen in January in B.C.

For Vancouver traders it will be business as usual, according to Michael Bernard, spokesman for the B.C. Securities Commission.

"I think it's a fact of life for people on the West Coast that we're marching to the clock of another, and so I don't see it having an enormous impact out here," Bernard said. "What it does back [East] is another matter."

The Toronto Stock Exchange opens and closes with the New York exchange and Ontario Premier Dalton McGuinty has already said his government is looking closely at the implications of a time change.

"We're not anxious to have a disconnect between us and our chief trading partner. We'll have to make an assessment as to whether or not it is in our interest," he said.

Gillian Bentley, spokeswoman for WestJet airlines, said a north-south time zone split will be a headache for North American travellers.

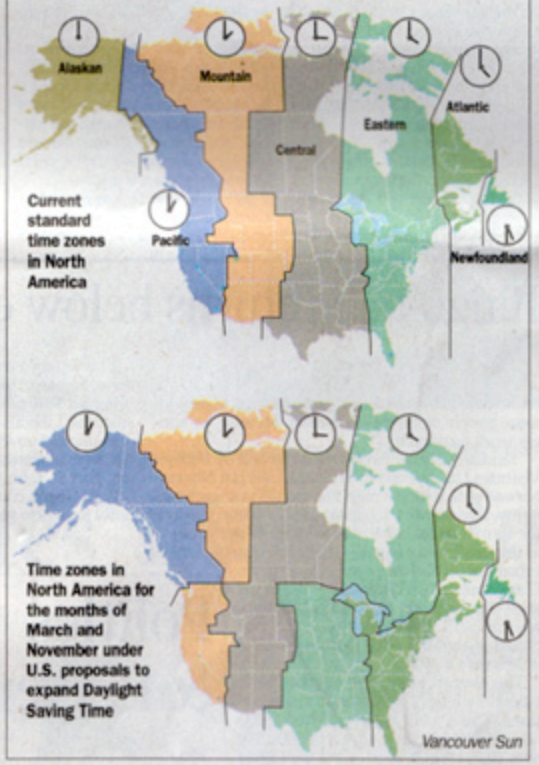
The time change could also disrupt flight schedules that work around local noise restriction hours, Bentley said.

Most areas in B.C. adopted daylight saving time when it was legislated by the federal government in 1918 as a way of reducing energy consumption. Parts of the Peace River district, however, do not "fall back" or "spring forward" because of opposition from the agricultural community.

bbadelt@png.canwest.com
with files from Canadian Press

Times they may be a changin'

Should U.S. President George W. Bush sign a bill for daylight saving time to operate from the first weekend in March to the last weekend in November, B.C. would be in a time zone one hour earlier than our neighbours in Washington, Oregon and California, but in the same time zone as Alaska.



1. Ecological Concerns
2. Stantec Profile
3. Daylighting tools
4. Case Studies
5. Conclusions

Turn Off the Lights!

US Government plans to extend daylight savings by two months a year.

The country will save 100, 000 barrels of a oil a day or 1% of national consumption through reducing artificial lighting in the evening.

Source:
(The Vancouver Sun, 21 July 2005)

Stantec

Consumer Awareness
Increasing mainstream media coverage of North American energy concerns will result in increased demand for sustainable and renewable energy options in building design.

Source:
(National Geographic, August 2005)

Stantec

Consumer Awareness
Increasing mainstream media coverage of North American energy concerns will result in increased demand for sustainable and renewable energy options in building design.

Source:
(National Geographic, August 2005)

REPLACE ONE INCANDESCENT LIGHTBULB WITH A COMPACT FLUORESCENT LAMP AND YOU WILL SAVE THIS 500 POUND PILE OF COAL.

kind of liberty and are determined to find more.

Some experts think this pursuit is even more important than the war on terrorism. "Terrorism doesn't threaten the viability of the heart of our high-technology lifestyle," says Martin Hoffert, a professor of physics at New York University. "But energy really does."

Energy conservation

reckoning, but in the end you can't conserve what you don't have. So Hoffert and others have no doubt: It's time to step up the search for the next great fuel for the hungry engine of humankind.

Is there such a fuel? The short answer is no. Experts say it like a mantra: "There is no silver bullet."

between us and endless energy from the va
of space or the core of the Earth, the truth i
there's no single great new fuel waiting i
heart of an equation or at the end of a dr

Enthusiasm about hydrogen-fueled ca
give the wrong impression. Hydrogen is
source of energy. It's found along with o
in plain old water, but it isn't there for th
ing. Hydrogen has to be freed before it is u
and that costs more energy than the hyd
gives back. These days, this energy comes m
from fossil fuels. No silver bullet there.

The long answer about our next fuel is n
grim, however. In fact, plenty of contende
the energy crown now held by fossil fu

Stantec

It's not my fault

Between 1990 - 2003:
Energy consumption in Canada increased 22%

GHG emissions increased 23%

Buildings are responsible for ~30% of national energy consumption in Canada.

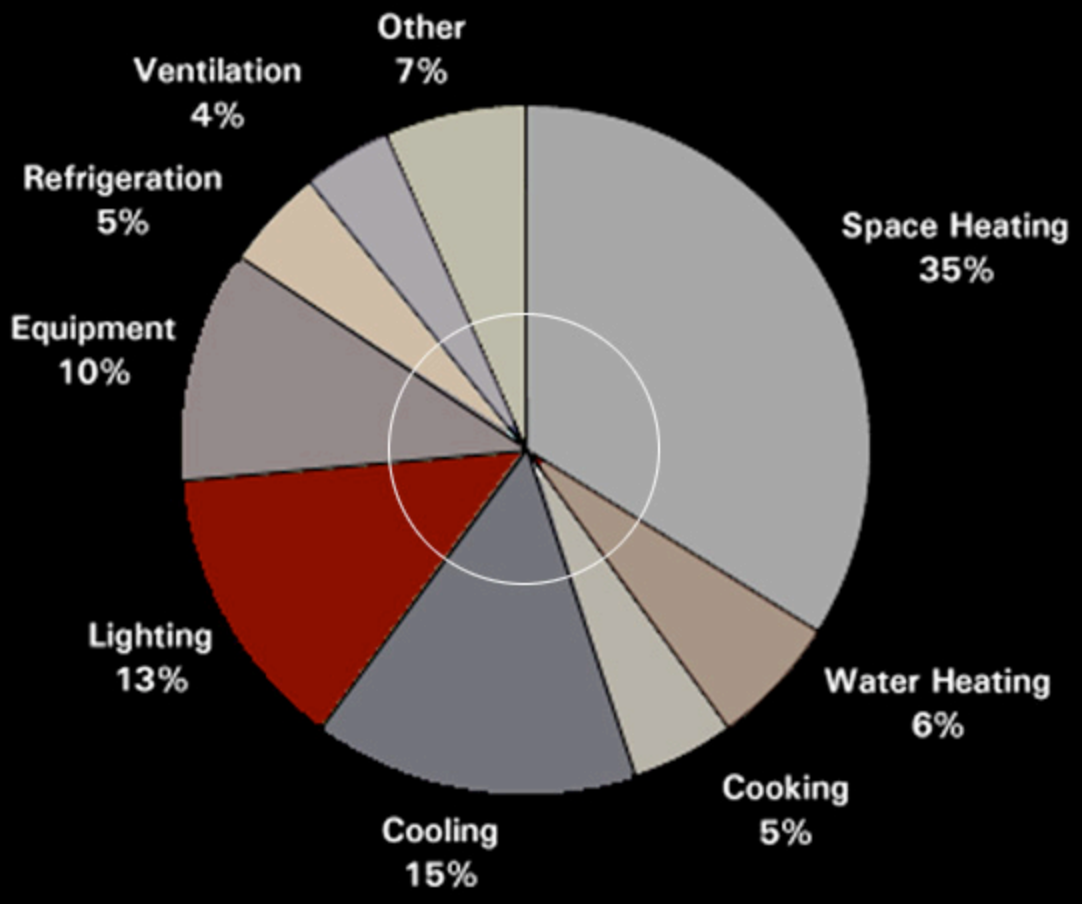
Buildings are responsible for 30% of GHG production in the Canada

There are ~1.8 hectares of land per capita in the world to meet our needs to survive.

Canada's Ecological Footprint (2001): 6.4 Ha

Source:
(Natural resources Canada, www.oee.nrcan.gc.ca)

Stantec



Energy Use In Buidlings

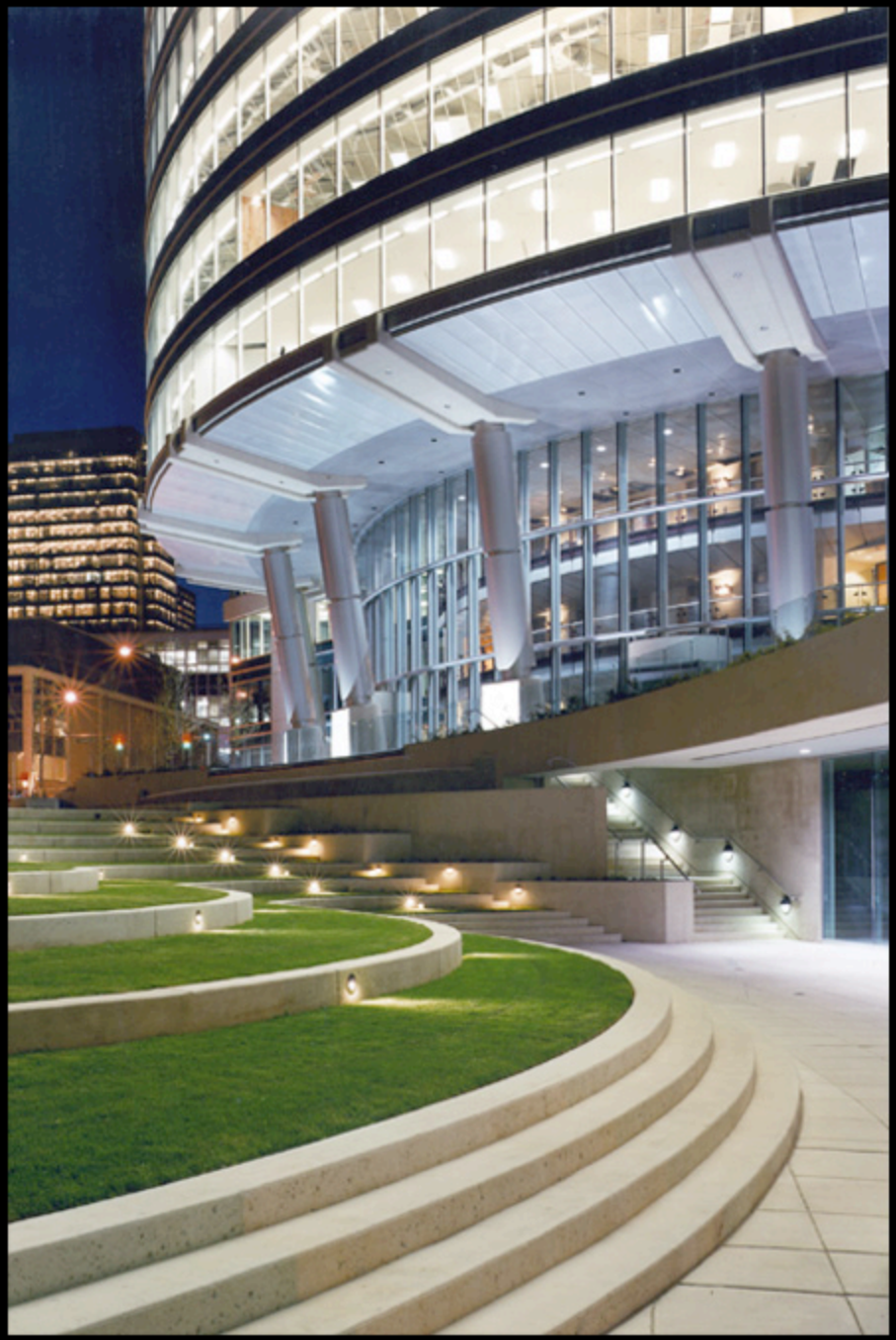
Commercial buildings in US consumed 5300 trillion btu of energy (1999).

The goal is not just to reduce the size of the individual slices, but to reduce the size of the pie itself.

Lighting is the the end use with the greatest potential for energy conservation.

Source:
(Energy Information Administration, www.eia.doe.gov, 2000)

Stantec



Stantec
Canadian-based, North American professional design and consulting services firm

Publicly traded company

>4500 employees across North America

51 years of profitability

Vancouver office
244 Staff
Architects, Engineers (M/P/E/S/C), Interior Designers and Project Managers

Stantec

Stantec
Canadian-based, North American professional design and consulting services firm

Publicly traded company

>4500 employees across North America

51 years of profitability

Vancouver office
244 Staff
Architects, Engineers (M/P/E/S/C), Interior Designers and Project Managers

Stantec

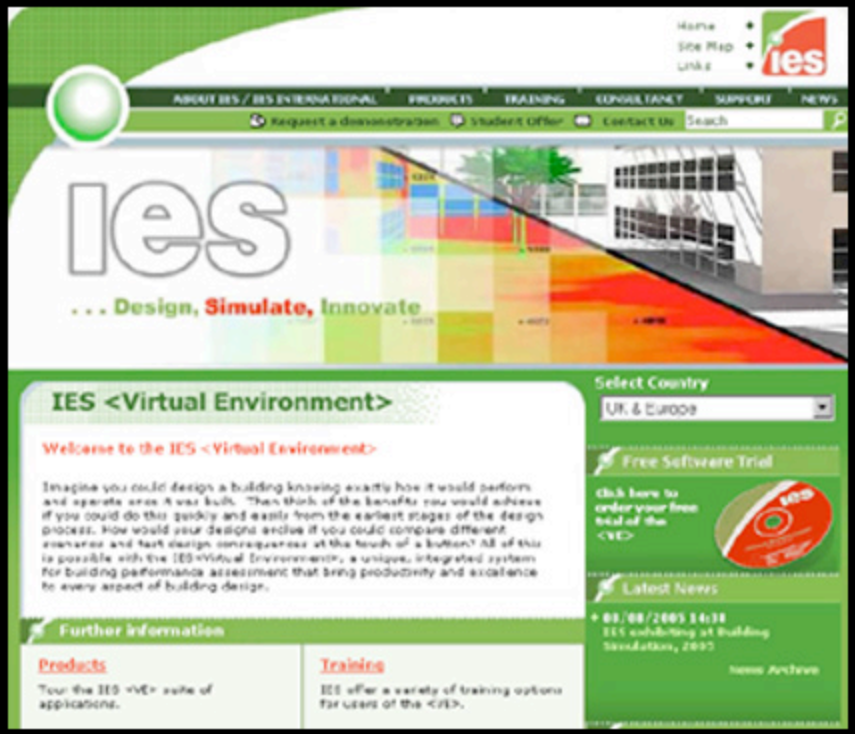
Help
Gallery
Feedback
Download
Links

Desktop Radiance

Radiance User Interface for Windows
What is it?

Acknowledgements

| What is it? | Help | Gallery | Feedback | Download | Announcement | Links |
| Home | Webmaster | Building Technologies Department | EETD | Berkeley Lab |



Daylighting Software

Desktop Radiance
Modeled in Form-Z
Imported into Autocad R14 with Desktop Radiance plug-in

IES <Virtual Environment>
Modeling, simulation and analysis in IES VE

Stantec

Software Package	Radiance IES, ModelIT	Desktop Radiance, AutoCad R14, FormZ
Import 3D models	No (2D DXF only)	Yes
Modeling	Easy for simple forms; very basic modeler	Can use other software to create complex geometries
File management	Clean	Confusing and intensive
Integrated Design	Very easy; 1 model	Model cannot be used by other simulation tools
Software Support	Training and support through IES	Yahoo web forum only
Software Stability	Seems very stable	Crashed occasionally
Ease of Use	Quick learning curve	Complicated
Cost	$$$	Free; requires AutoCad

Stantec

Seymour-Capilano
Water Filtration Project

$300 million infrastructure project

Operations and Maintenance Centre (3200 sq. m.) is targeting LEED Gold

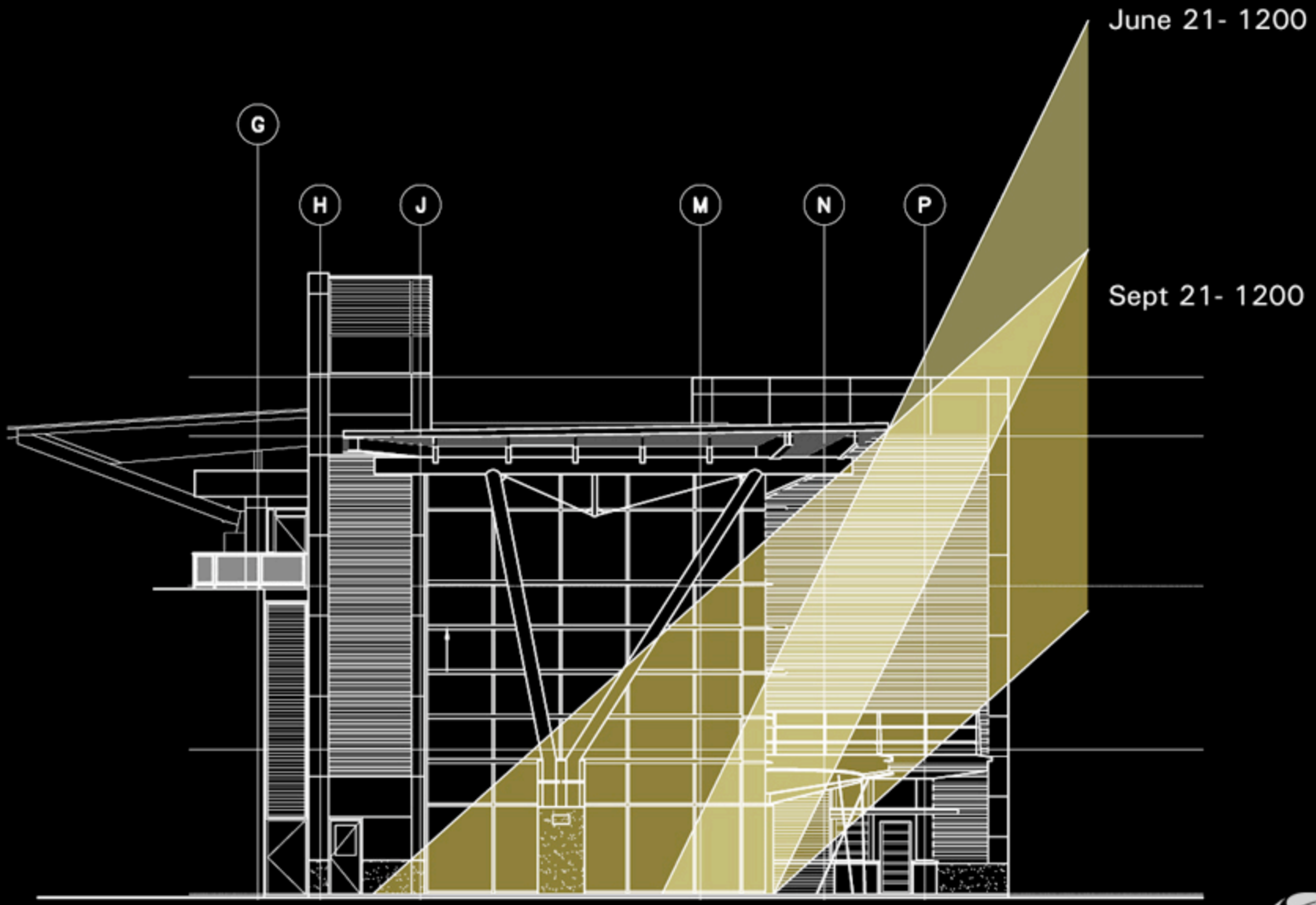
Project Completion in 2007

Modeled building in Form-Z for export to desktop radiance

Transparency and views key design drivers

Set to achieve 2% daylight factor in 80% of building area

Stantec



Seymour-Capilano Water Filtration Project

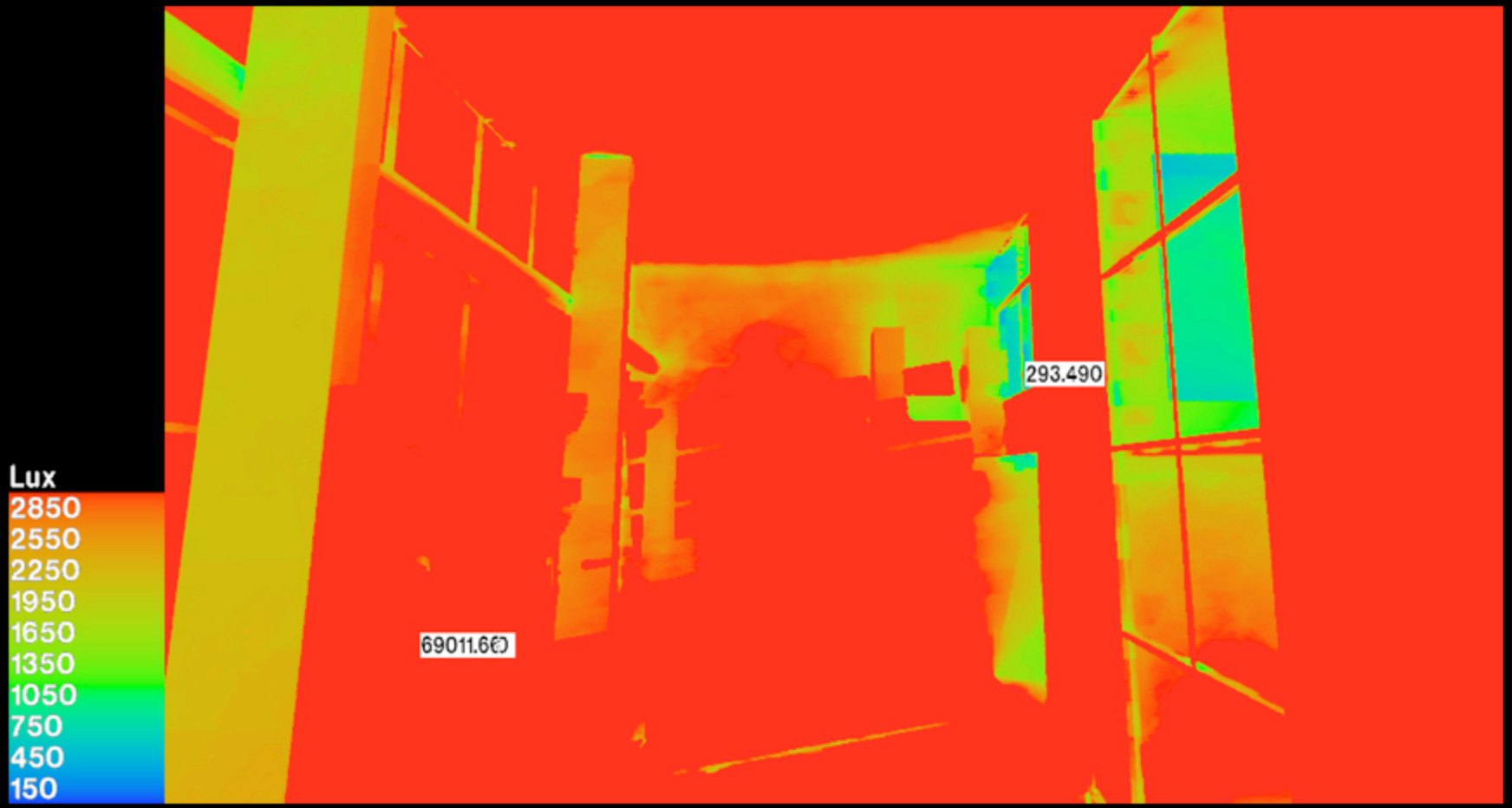
Elevation of the entrance lobby

Stantec

Seymour-Capilano Water Filtration Project

21 August - 1200 - Clear Sky - no external shading

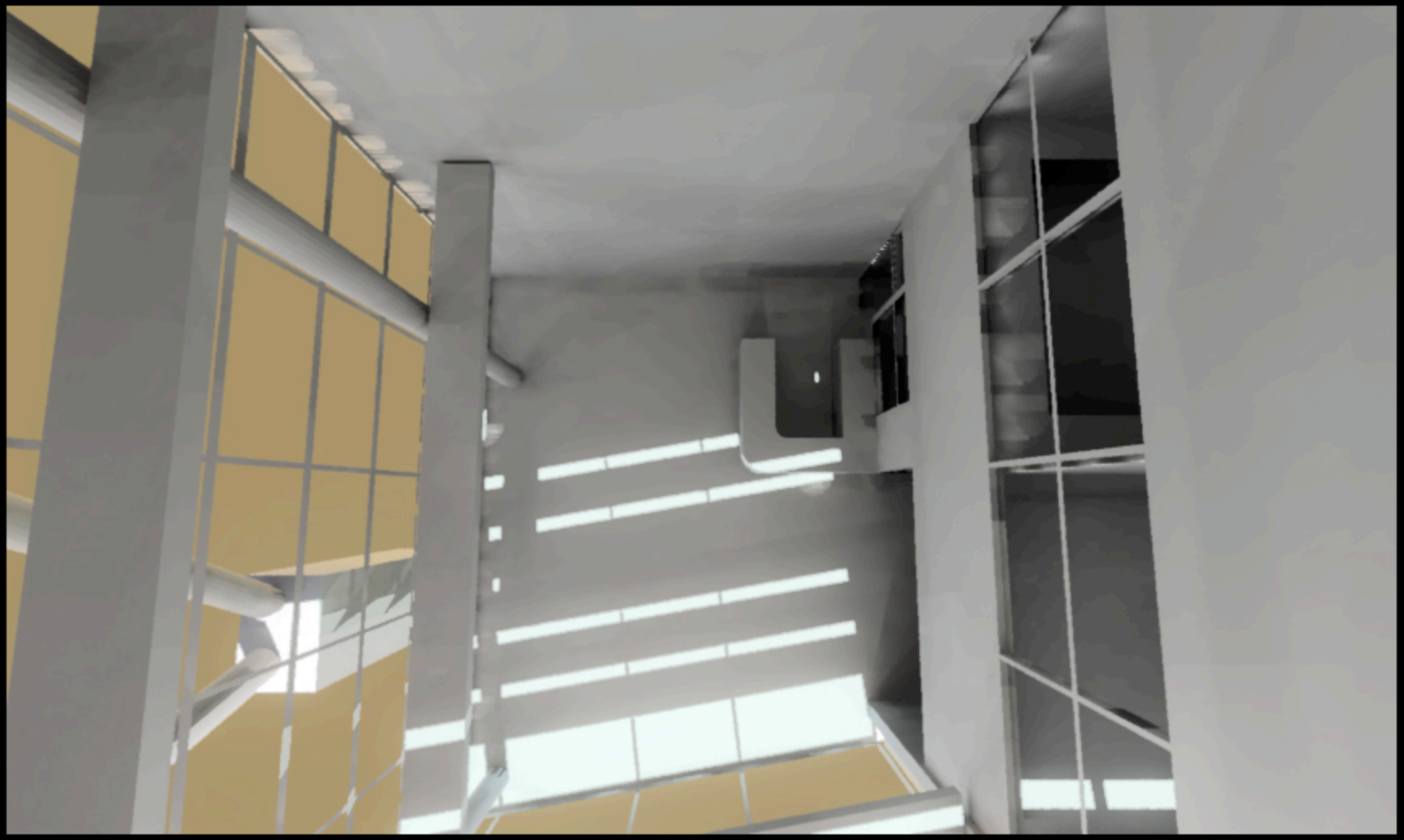
Stantec



Seymour-Capilano Water Filtration Project

21 August - 1200 - Clear Sky - no external shading

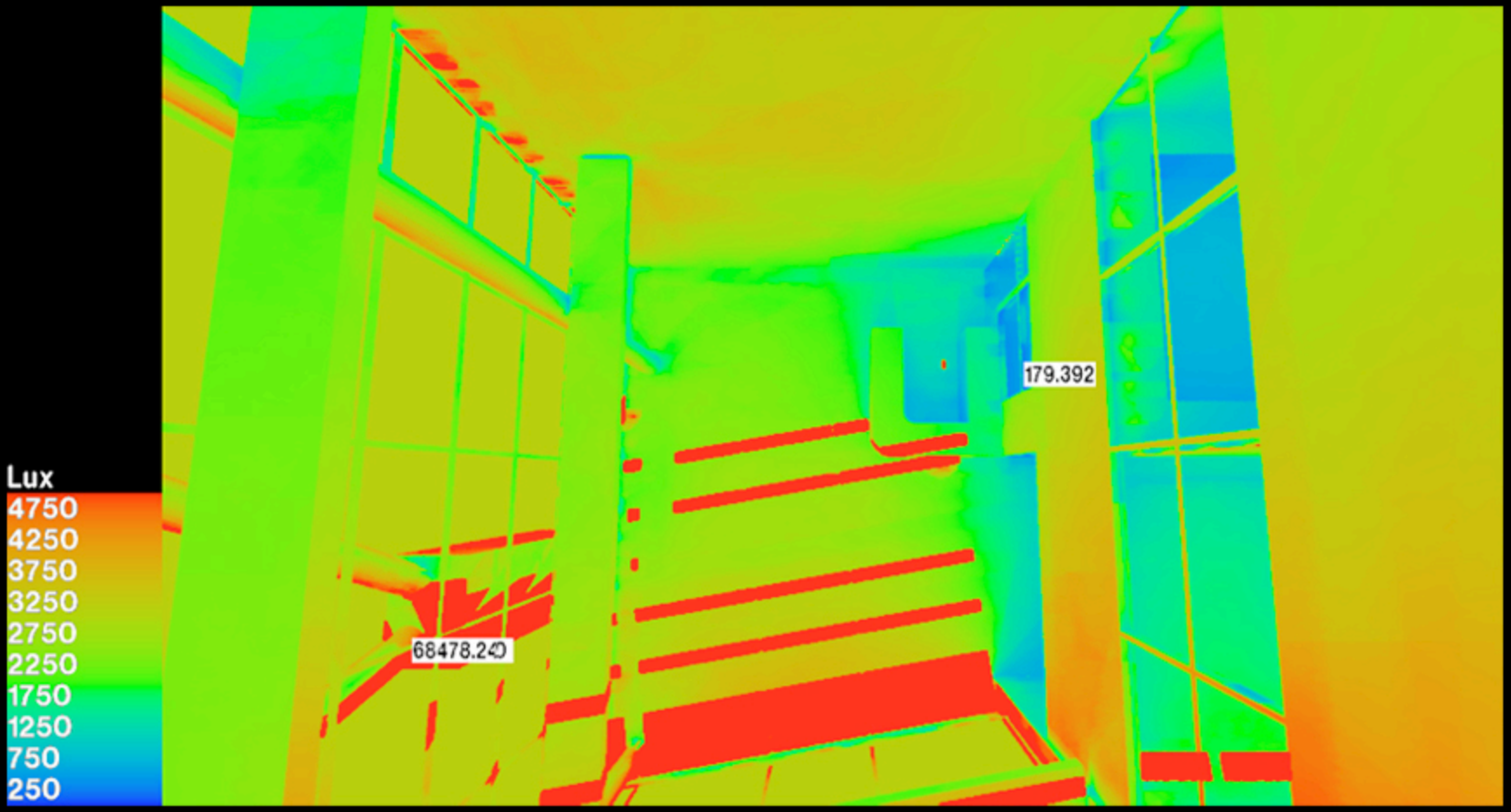
Stantec



Seymour-Capilano Water Filtration Project

21 August - 1200 -Clear Sky - standard curtain wall sunscreen

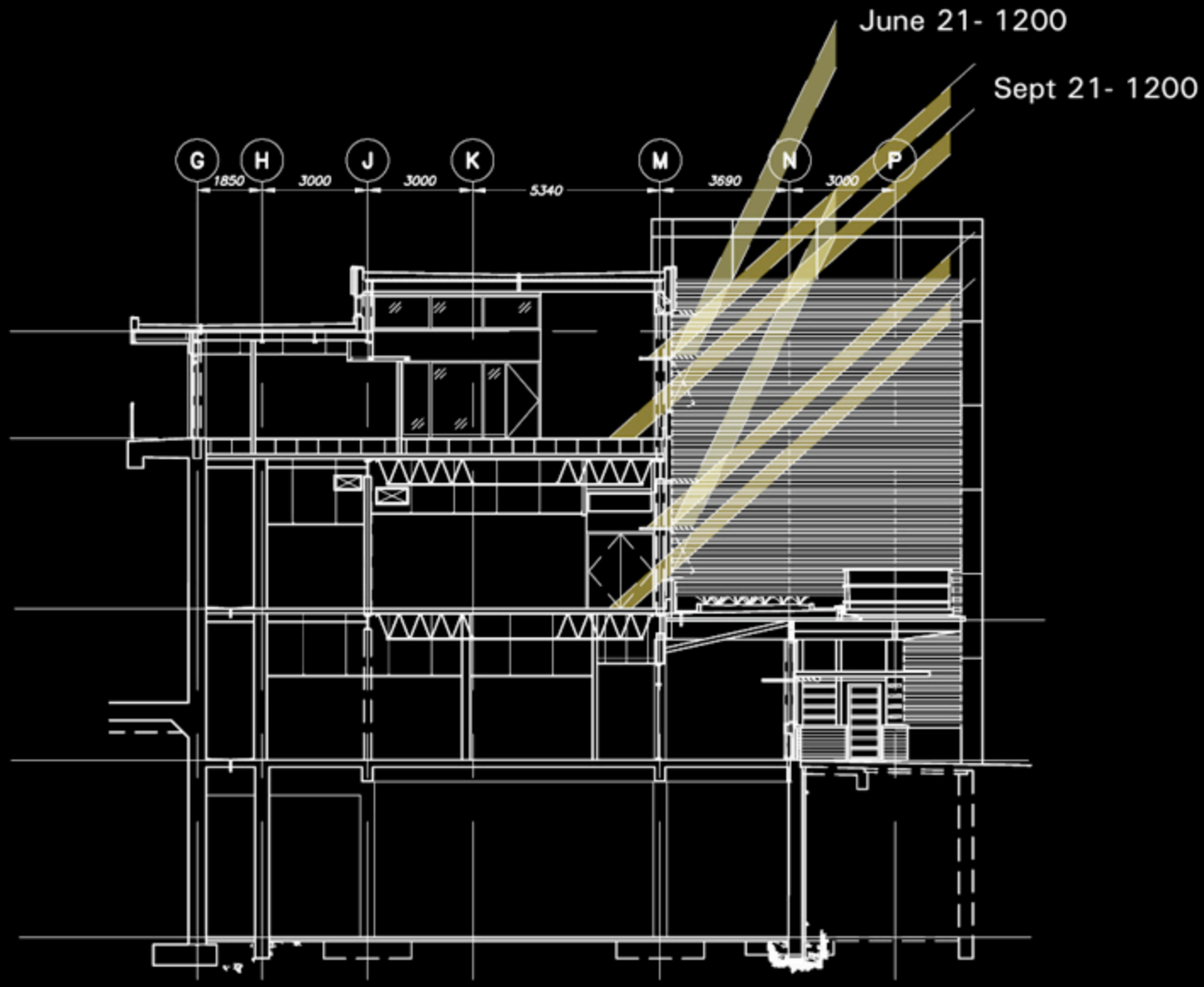
Stantec



Seymour-Capilano Water Filtration Project

21 August - 1200 -Clear Sky - standard curtain wall sunscreen

Stantec



Seymour-Capilano Water Filtration Project

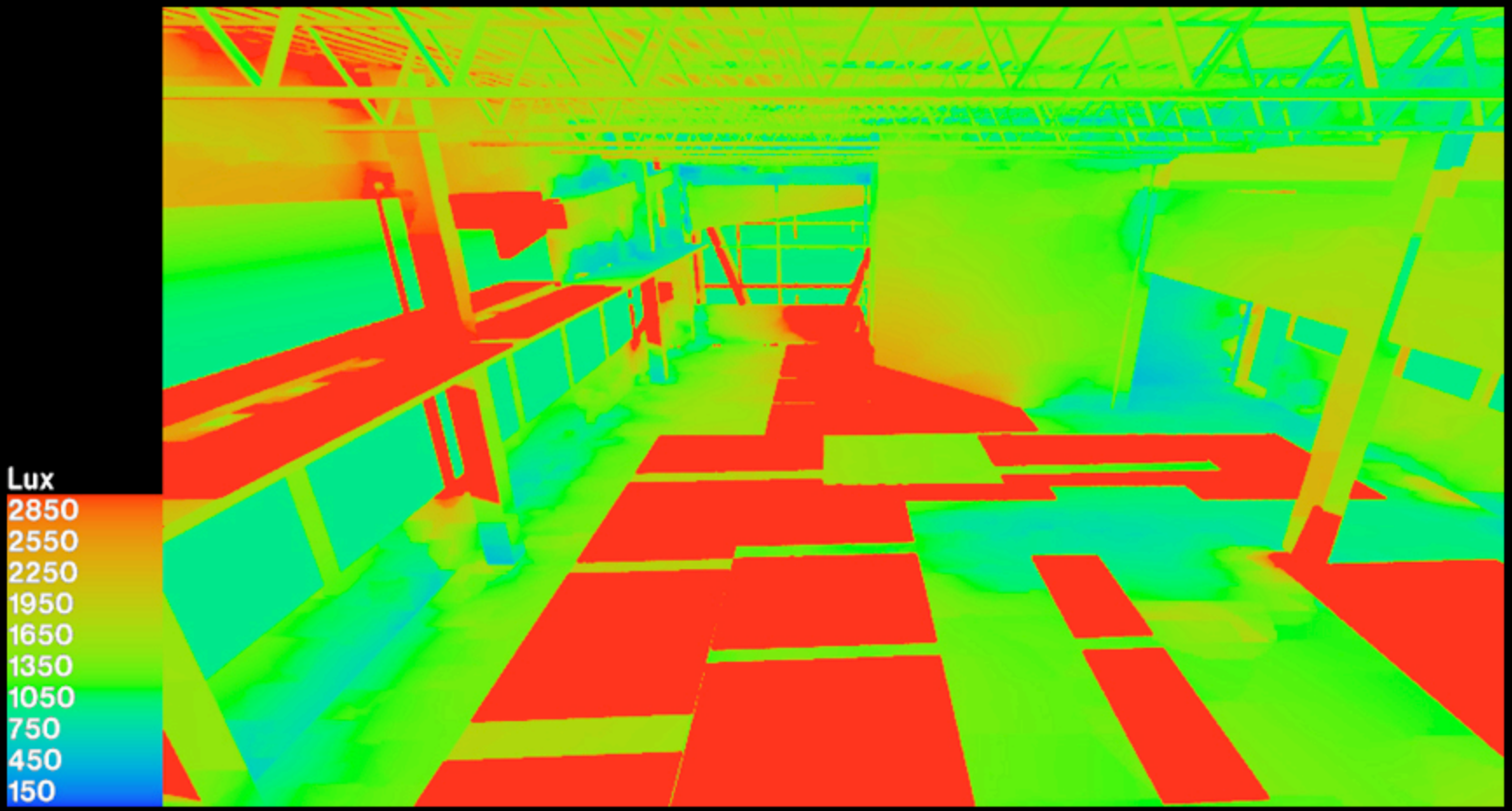
Section through Control Room and Labs

Stantec

Seymour-Capilano Water Filtration Project

21 December - 1200 - Clear Sky - light shelf only

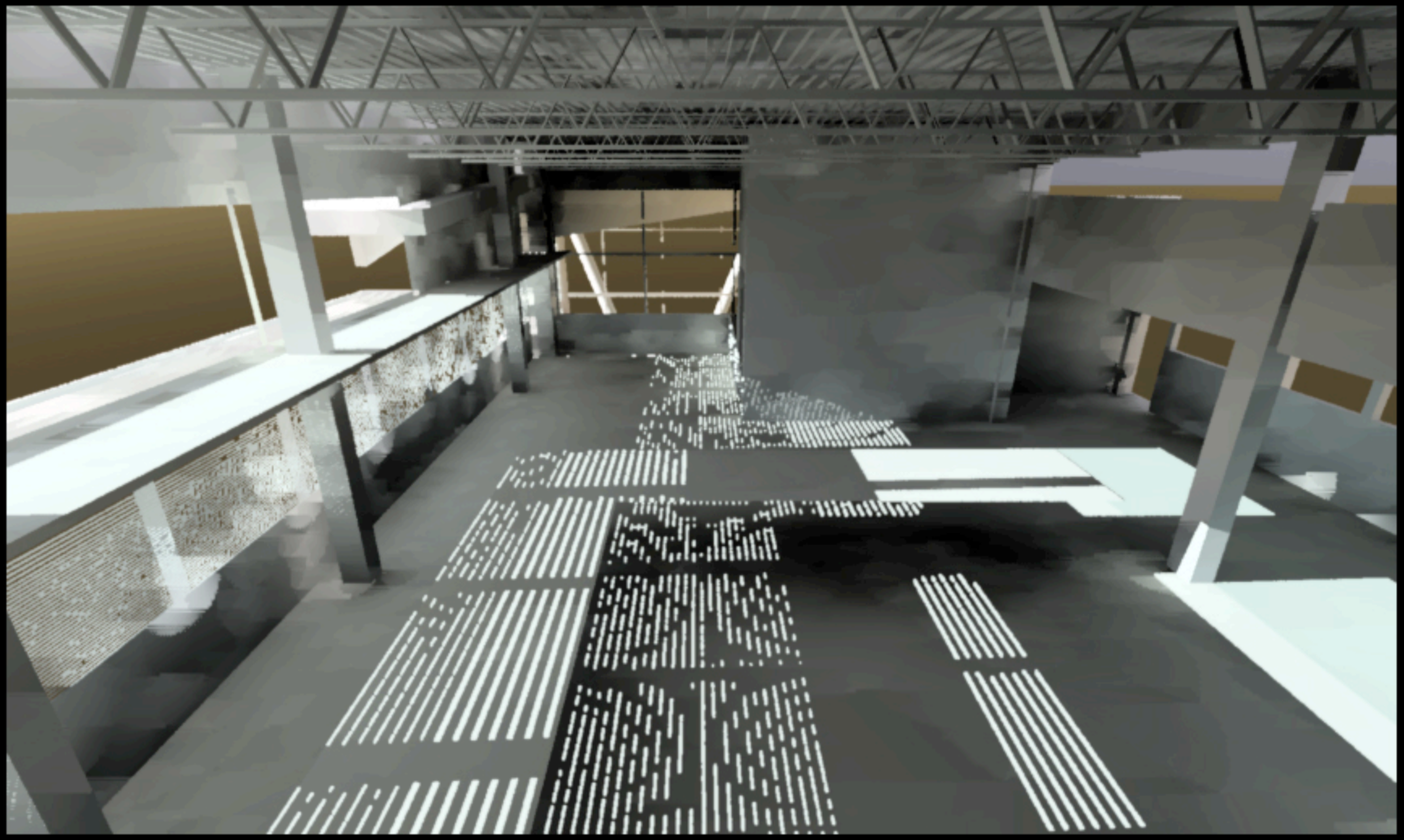
Stantec



Seymour-Capilano Water Filtration Project

21 December - 1200 - Clear Sky - light shelf only

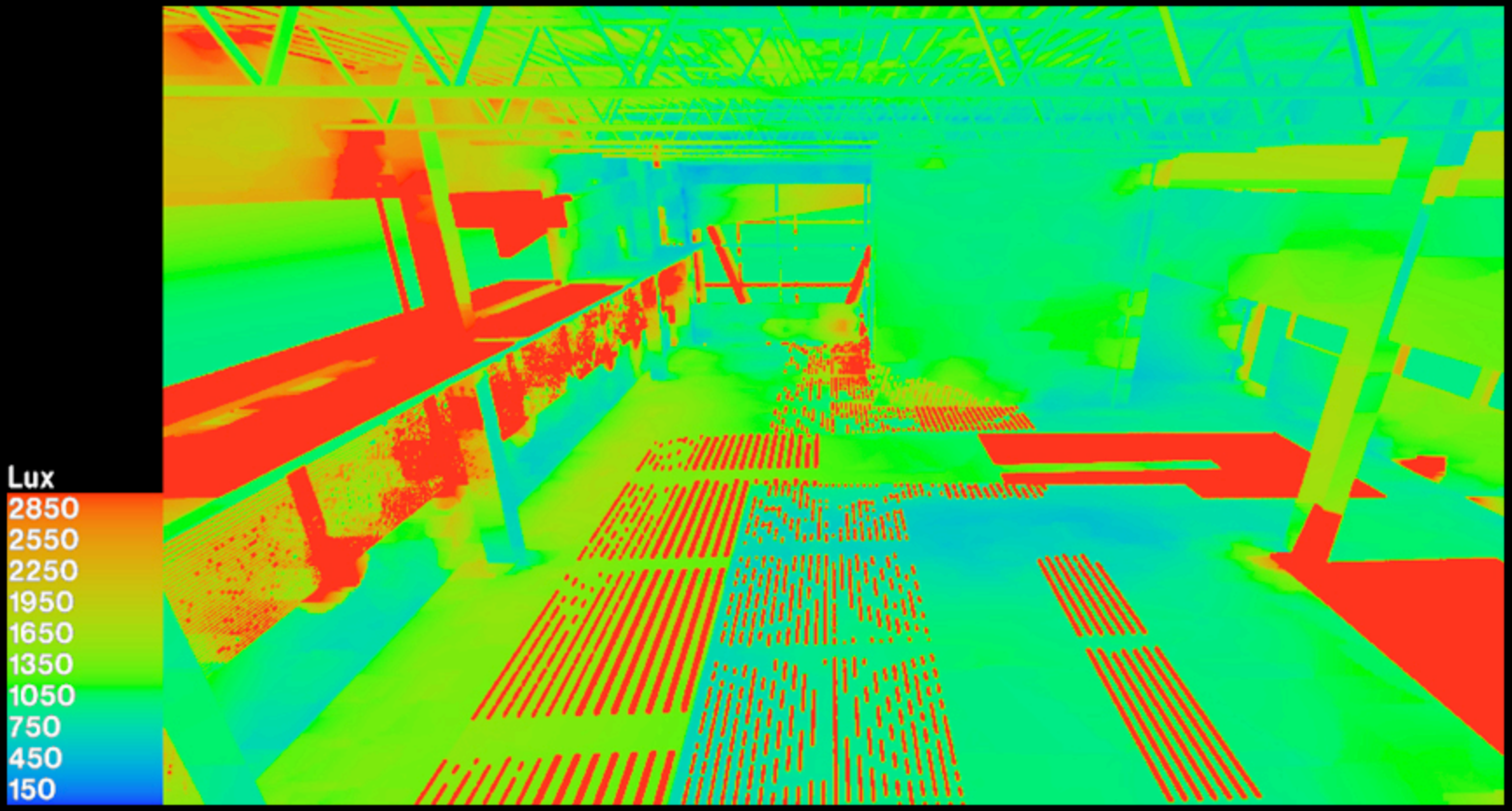
Stantec



Seymour-Capilano Water Filtration Project

21 December - 1200 - Clear Sky - light shelf with lower blinds

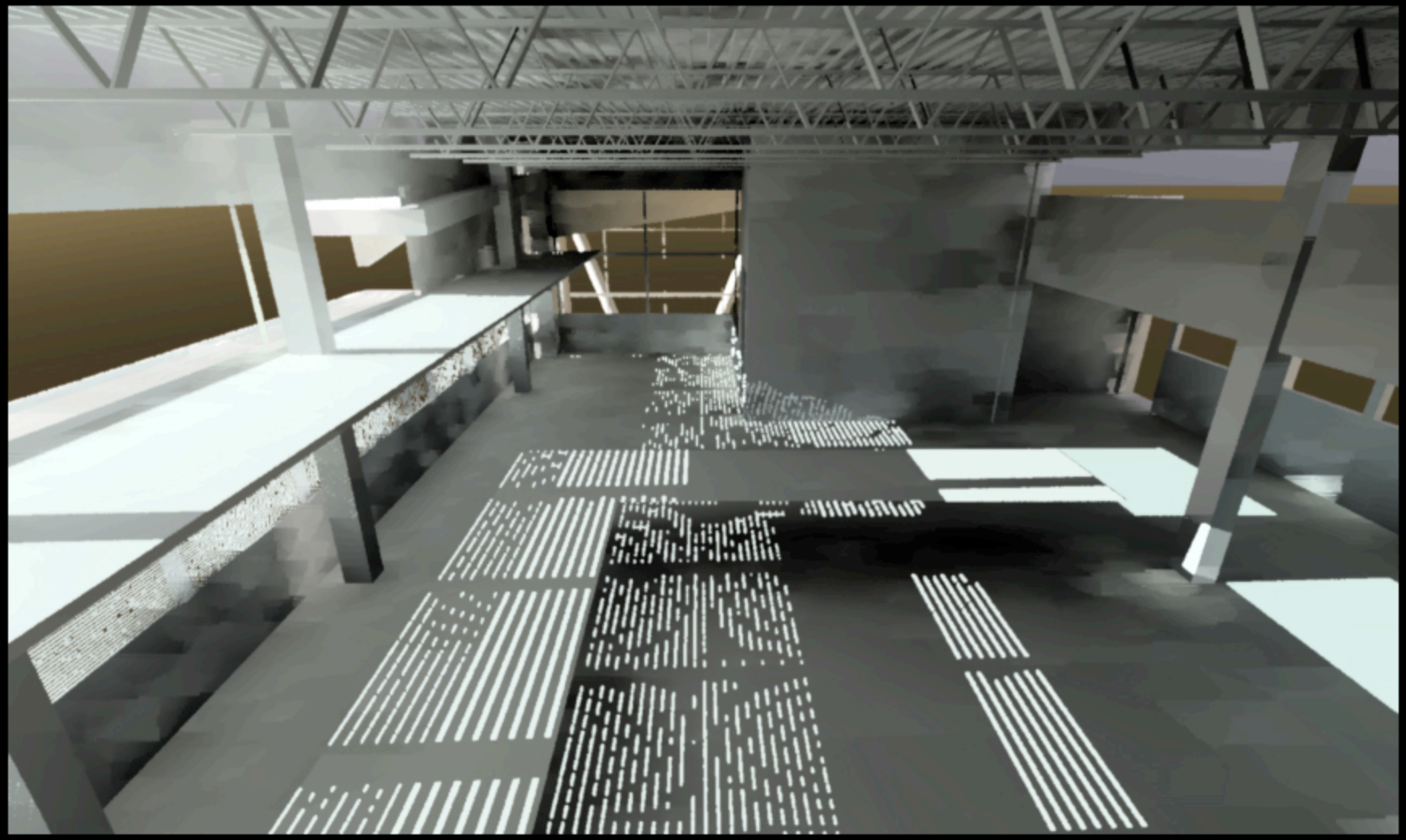
Stantec



Seymour-Capilano Water Filtration Project

21 December - 1200 - Clear Sky - light shelf with lower blinds

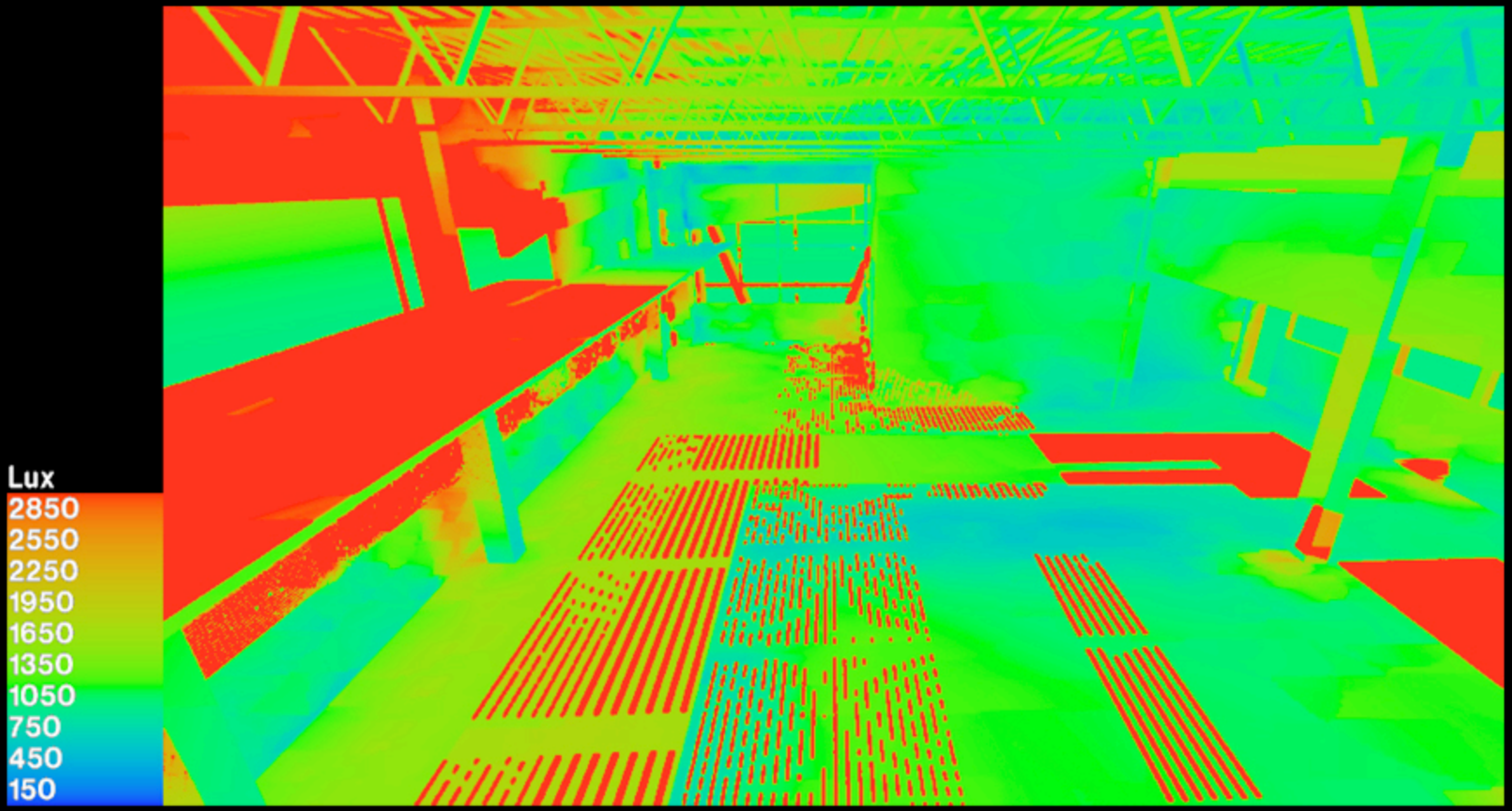
Stantec



Seymour-Capilano Water Filtration Project

21 December - 1200 - Clear Sky - extended light shelf with lower blinds

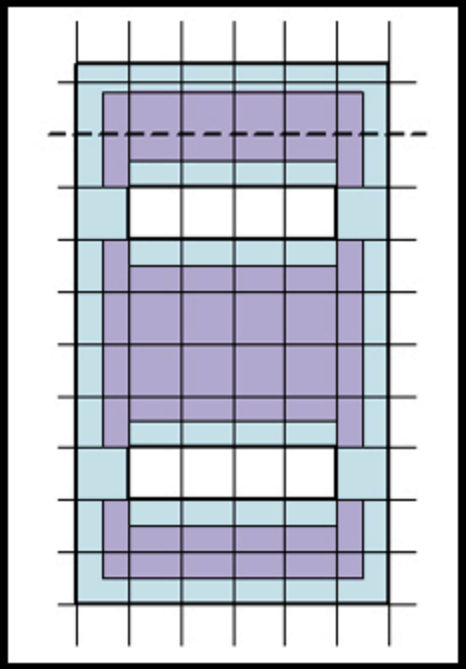
Stantec

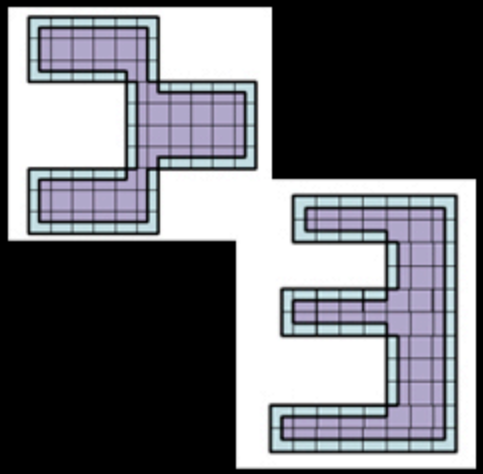


Seymour-Capilano Water Filtration Project

21 December - 1200 - Clear Sky - extended light shelf with lower blinds

Stantec





Daylight Dilemma in Hospitals

Hospital Authorities greatest life cycle cost is the combined cost of employees (salary, productivity, churn, benefits, etc.)

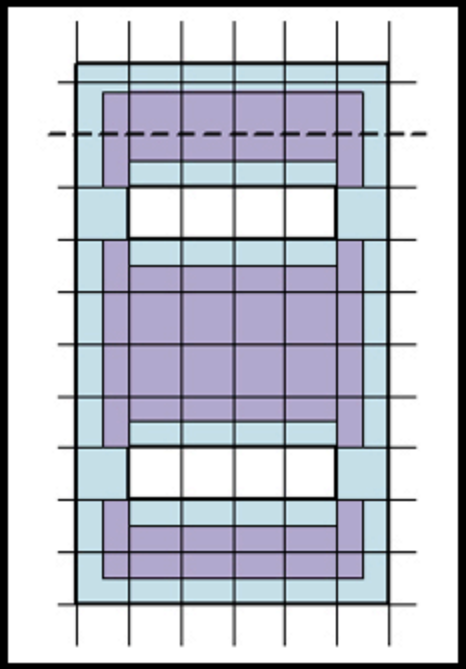
Healthcare workers spend the majority of their day in artificially lit spaces

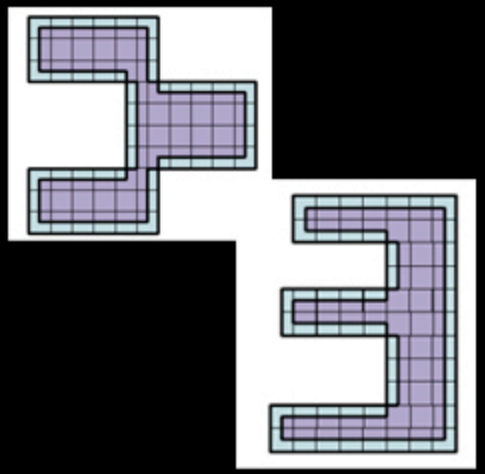
Nurses have 40% fewer errors when working in daylit spaces

Medical errors cause 23, 000 deaths/ year in Canada

Daylight in Diagnostic and Treatment Rooms - New Hospital - Vancouver, BC
Comparison of GGHC, LEED-Canada and LEED-NC 2.1

Stantec





Daylight Dilemma in Hospitals

3 typical daylit configurations in diagnostic and treatment wards:

Articulated blocks
Wings of light
Plan enclosed courtyard

Plan enclosed courtyard is the most functional because of flexibility and no dead ends

Based on 30 ft x 90 ft courtyards and 30ft grid

Increased construction cost of $7.50/ sf| $80/ sm is recovered in 3 years based on employee productivity gains

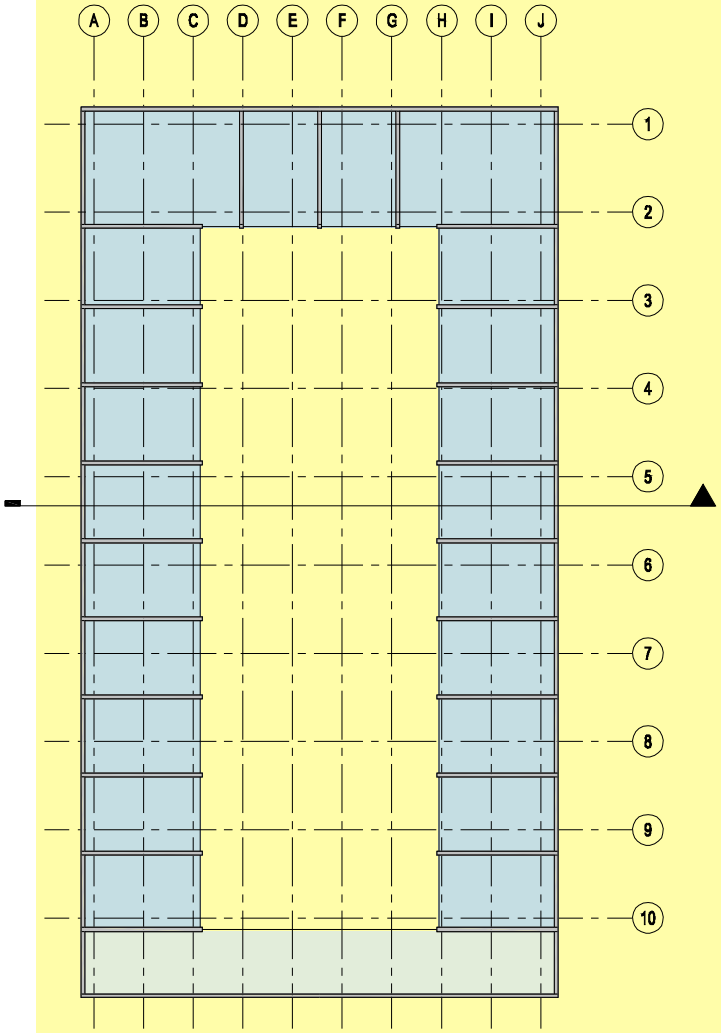
48, 600 SF - 47% of floor space within 15 ft of glazing

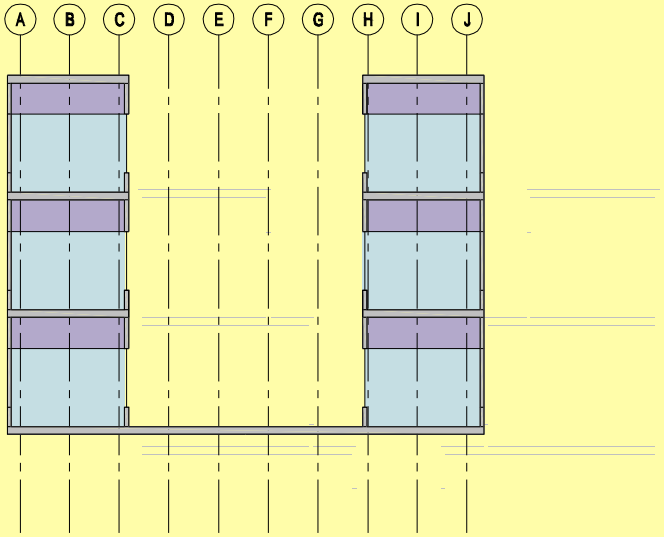
3 Green Guide for Healthcare Points

Daylight in Diagnostic and Treatment Rooms - New Hospital - Vancouver, BC
Comparison of GGHC, LEED-Canada and LEED-NC 2.1

Stantec

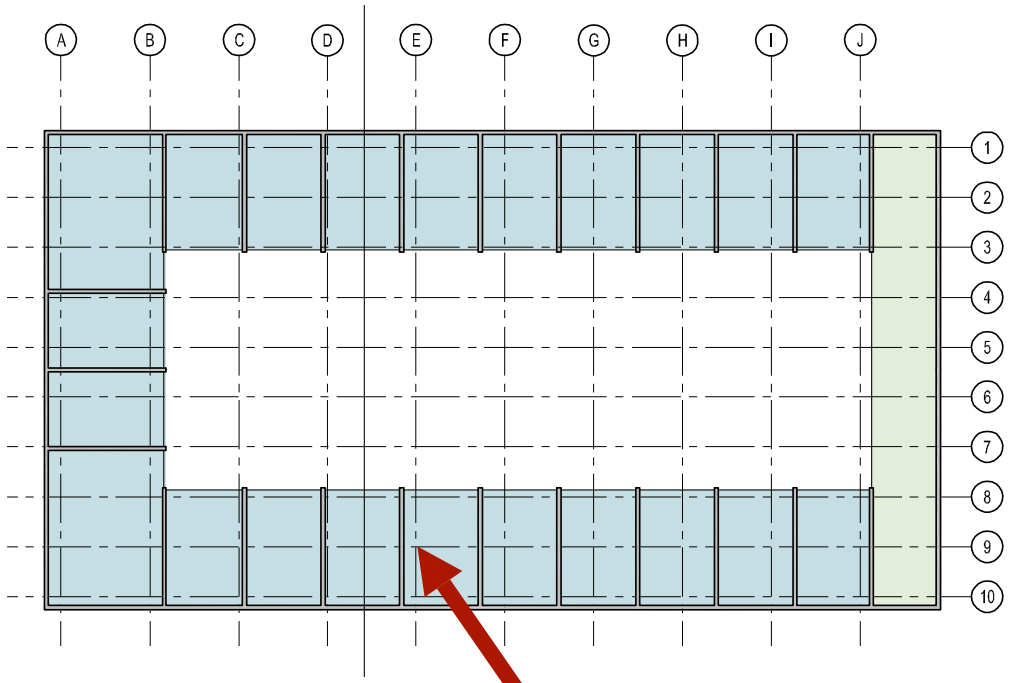
… effect of orientation





- 30’ x 90’ courtyard
- 3 floors @ 15’ fl. to fl.
- 15’ band of offices/exam rooms
- 8’ corridor on one end

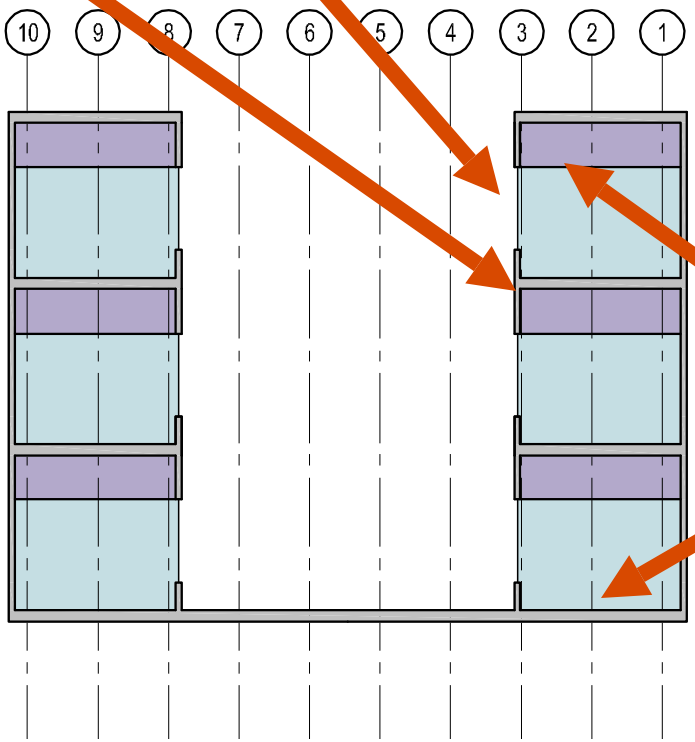
… measuring points



Readings taken at nodes of 6’-4” x 11’4” grid, excluding nodes in the courtyard

Walls 50% reflectance (something white)

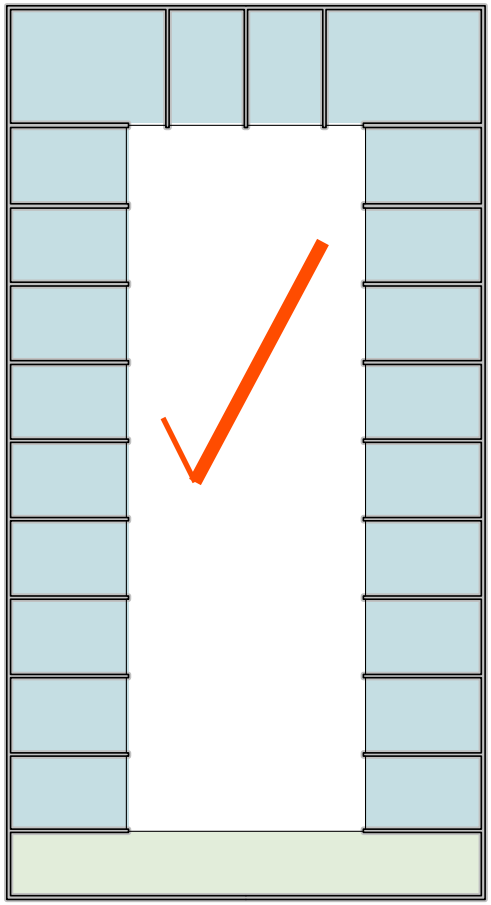
Glazing 70% transmittance (clear)

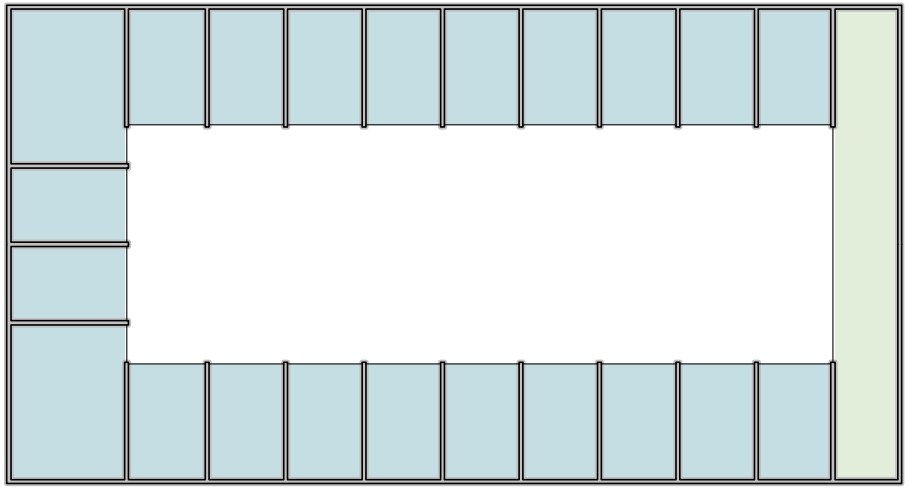


Ceilings 85% ref.

Floors 30% ref.

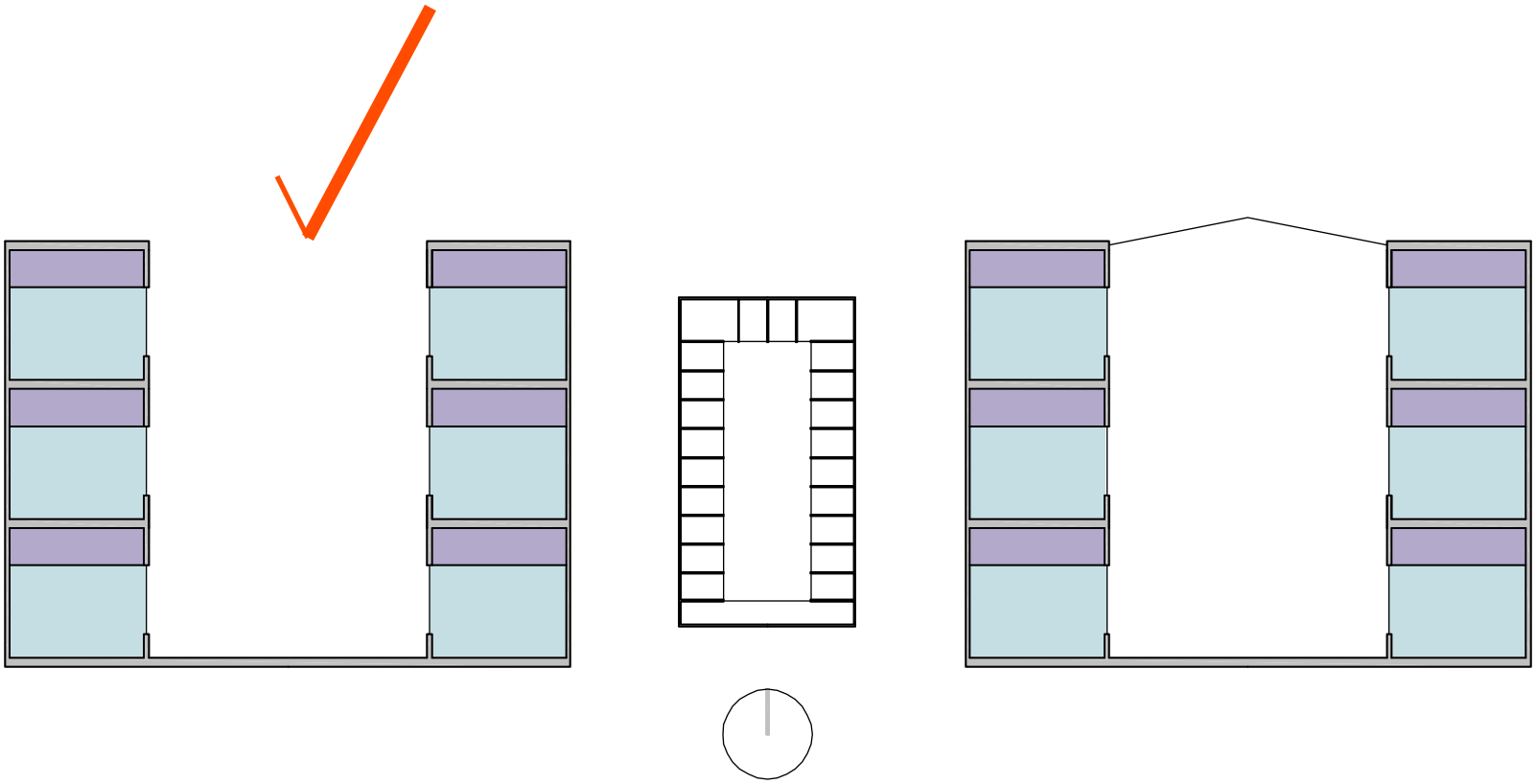
… effect of orientation





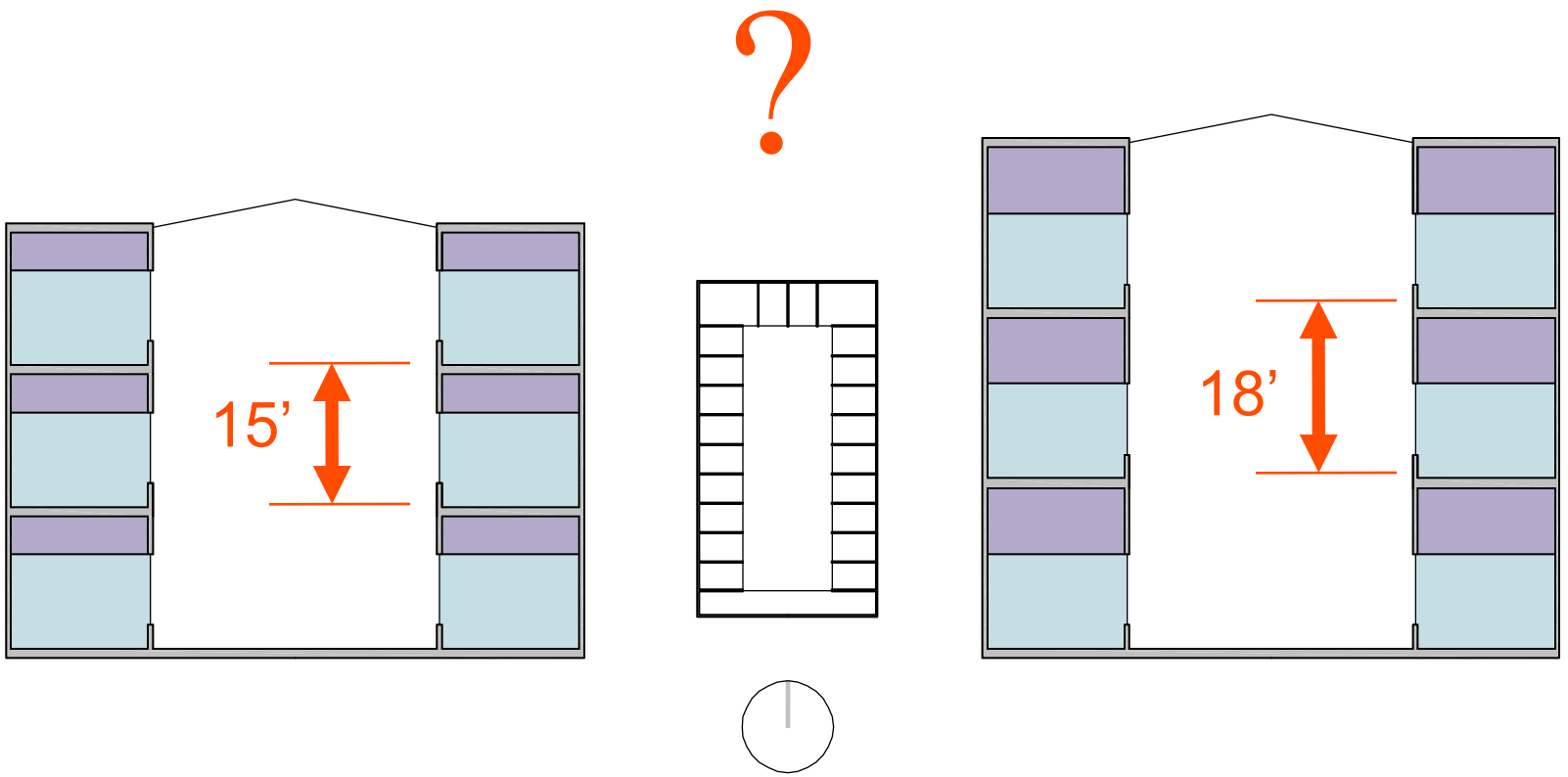
35.3%	LEED-NC 2.1	32.4%
55.9%	LEED CANADA-NC 1.0	41.2%

… effect of a fully glazed roof



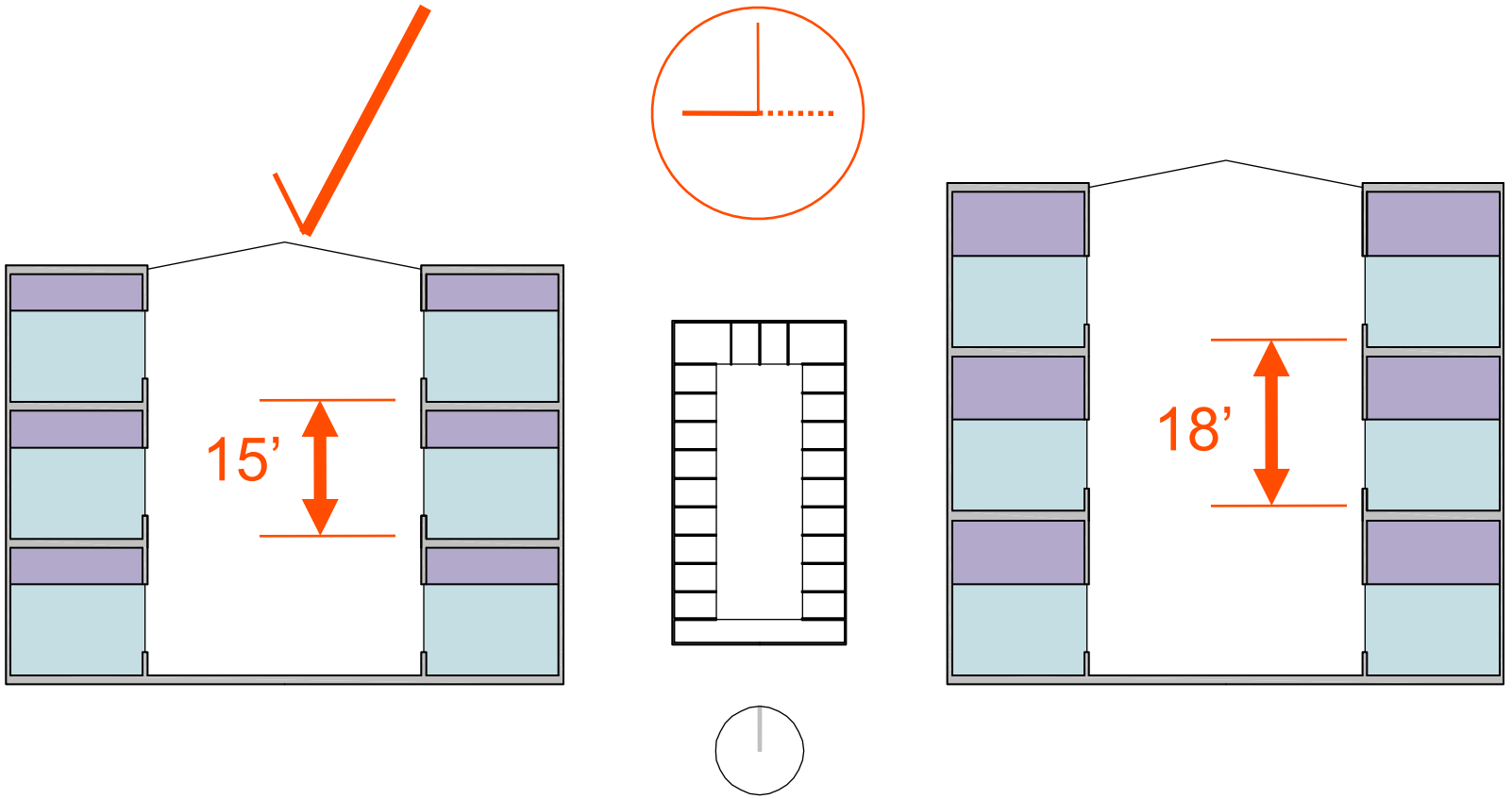
35.3%	LEED-NC 2.1	32.4%
55.9%	LEED CANADA-NC 1.0	38.2%

… effect of increased floor-to-floor height at noon



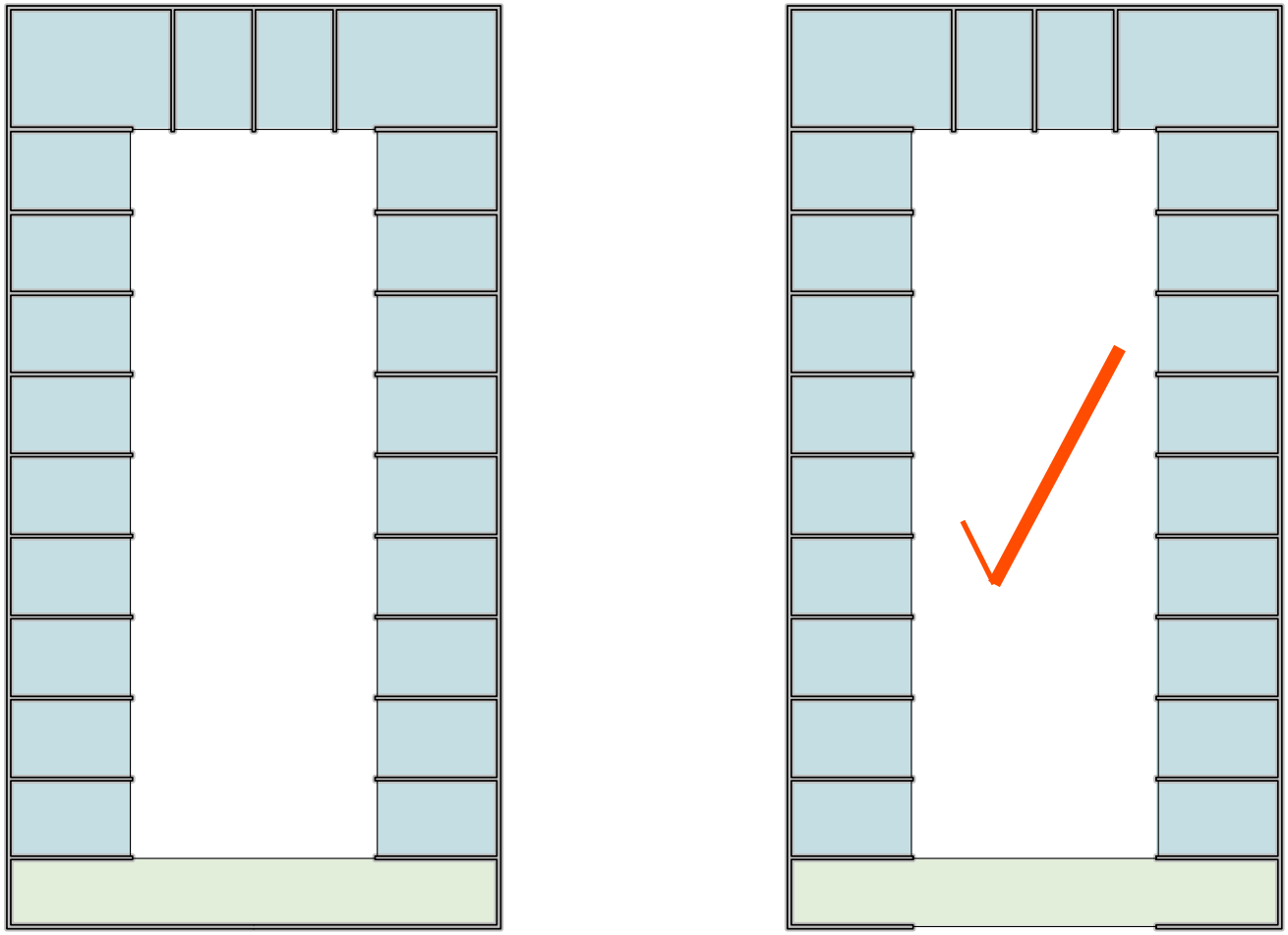
32.4%	LEED-NC 2.1	32.4%
38.2%	LEED CANADA-NC 1.0	38.2%

… effect of increased floor-to-floor height in the early morning



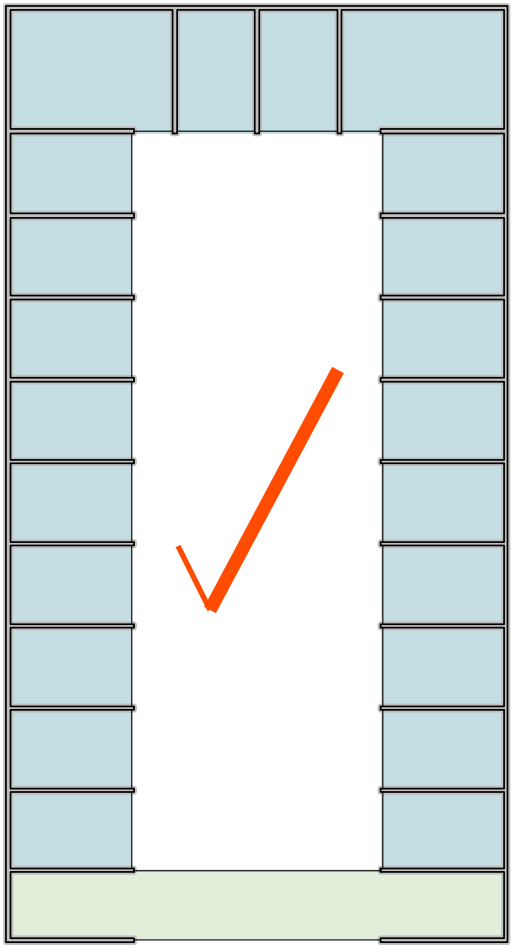
32.4%	LEED-NC 2.1	32.4%
41.2%	LEED CANADA-NC 1.0	26.5%

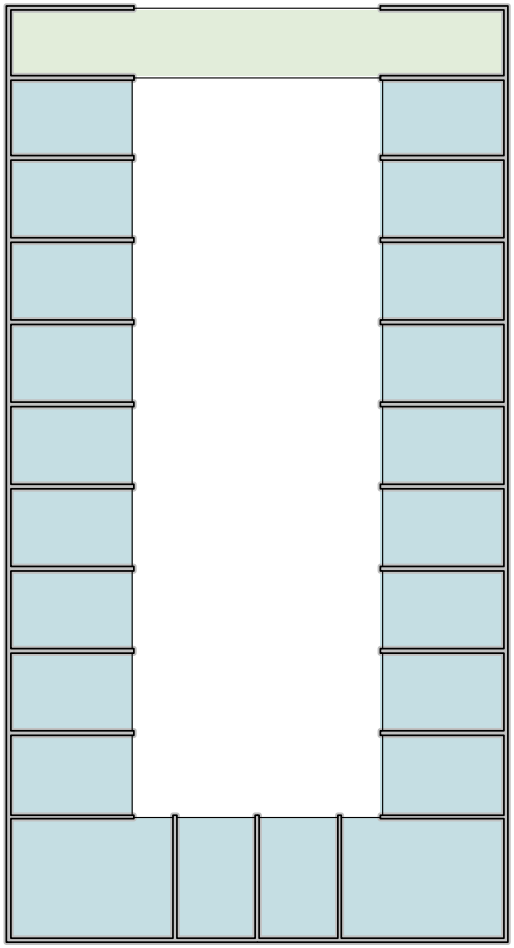
… effect of a fully glazed end corridor on all floors



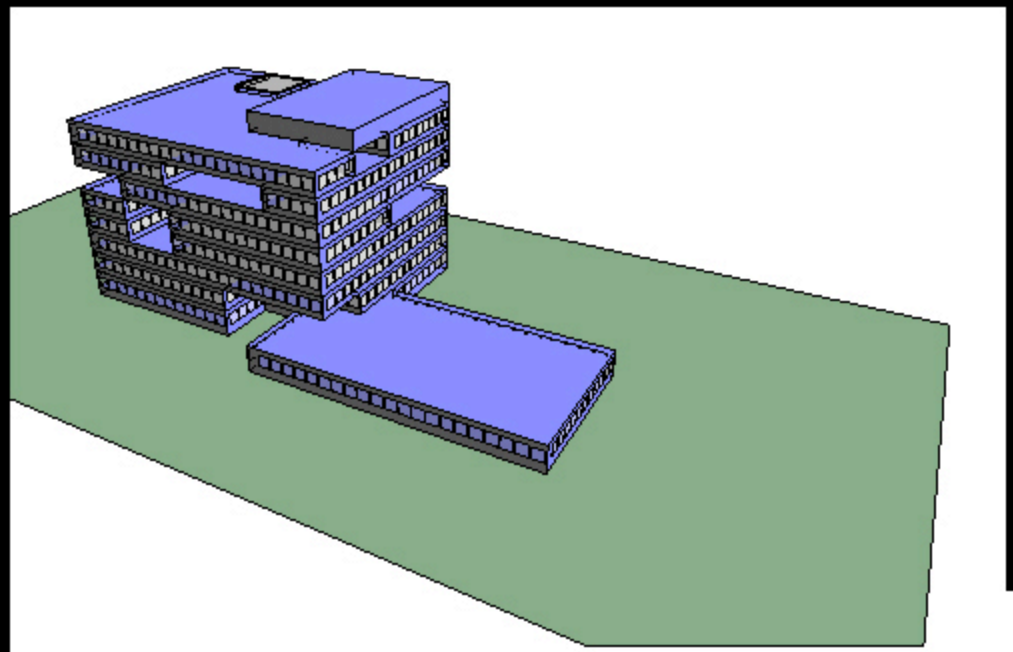
35.3%	LEED-NC 2.1	55.9%
55.9%	LEED CANADA-NC 1.0	64.7%

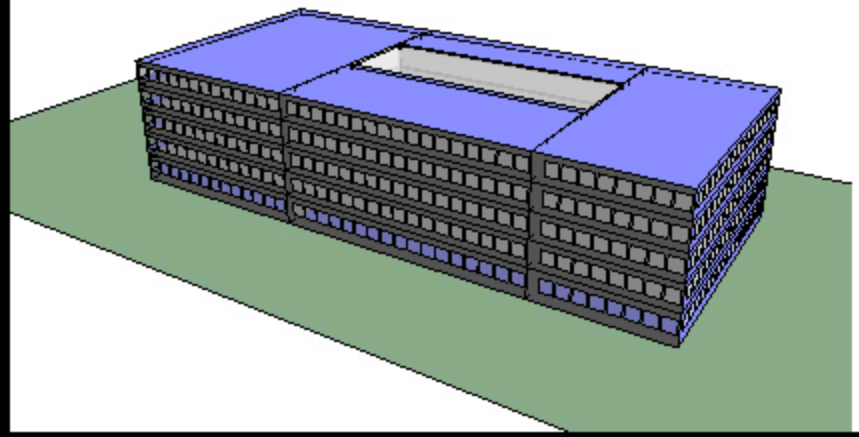
… effect of orientation of the fully glazed end corridor

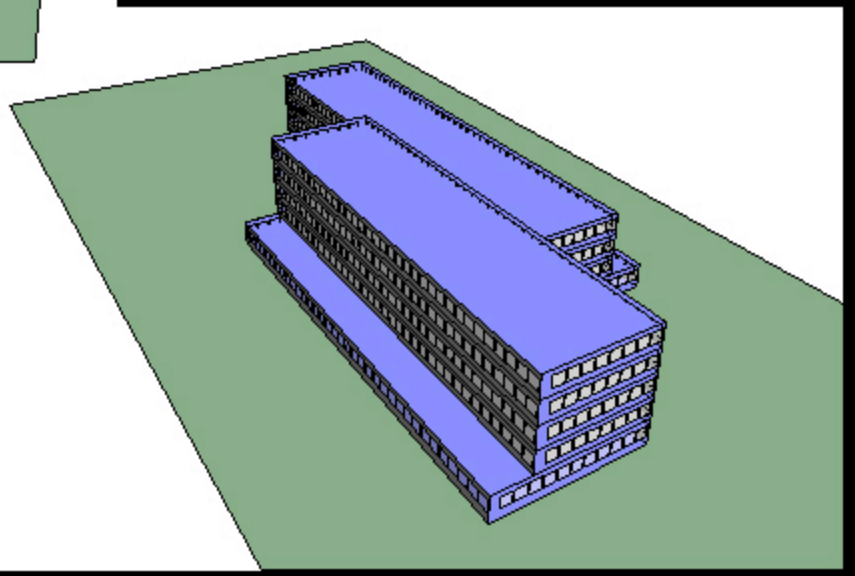




55.9%	LEED-NC 2.1	32.4%
64.7%	LEED CANADA-NC 1.0	27.9%



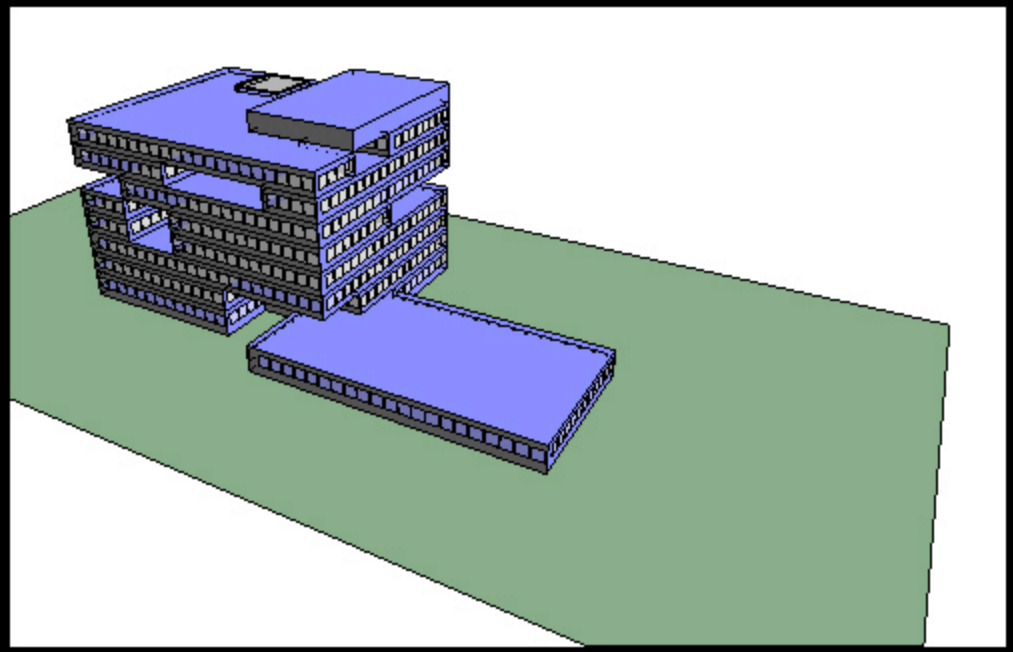




Children Development Centre - Calgary, Alberta

3 options - Stantec peer review

Stantec

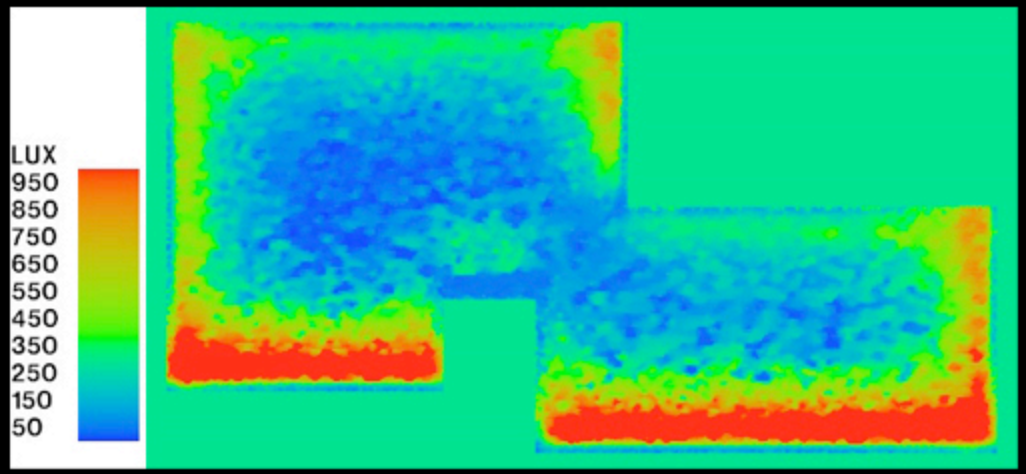


Option 1
Total floor area: 13068 m2
Glazing percentage: 29%

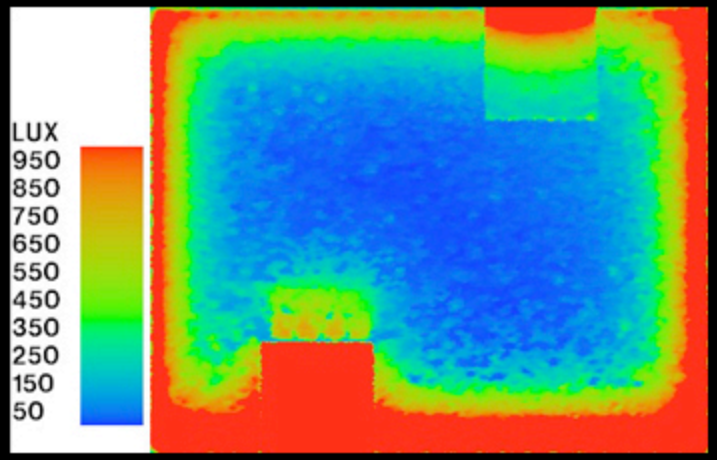
LEED Canada Credit 8.1
43.4% of floor area > 250 lux
(September 21 - 1200 - clear sky)

Total Energy: 102.5 kWh/m2

Peak Heating: 2202.6 kW
Peak Cooling: 459.2 kW



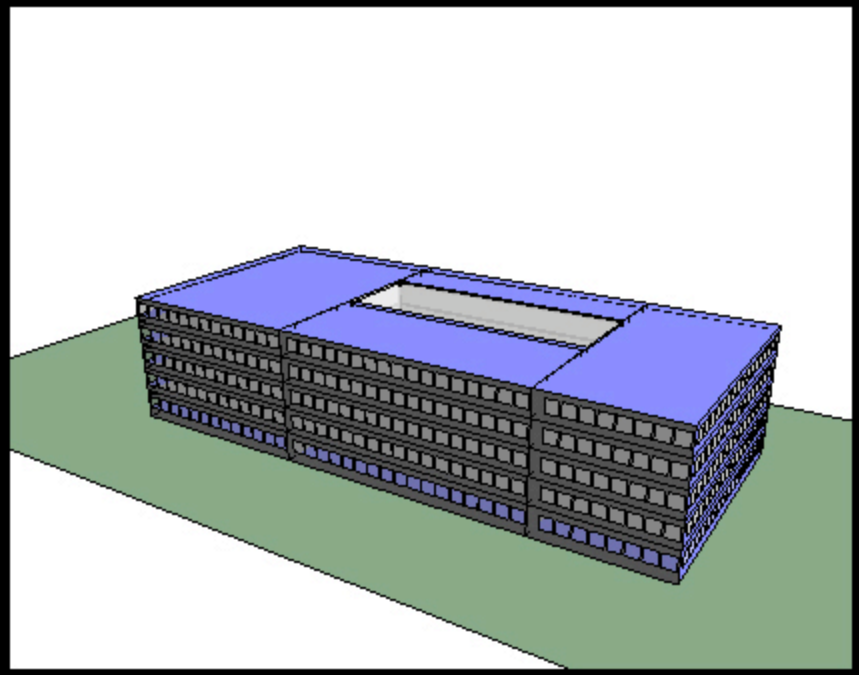
Level1



Level 4

Children Development Centre - Calgary, Alberta
3 options - Stantec peer review

Stantec

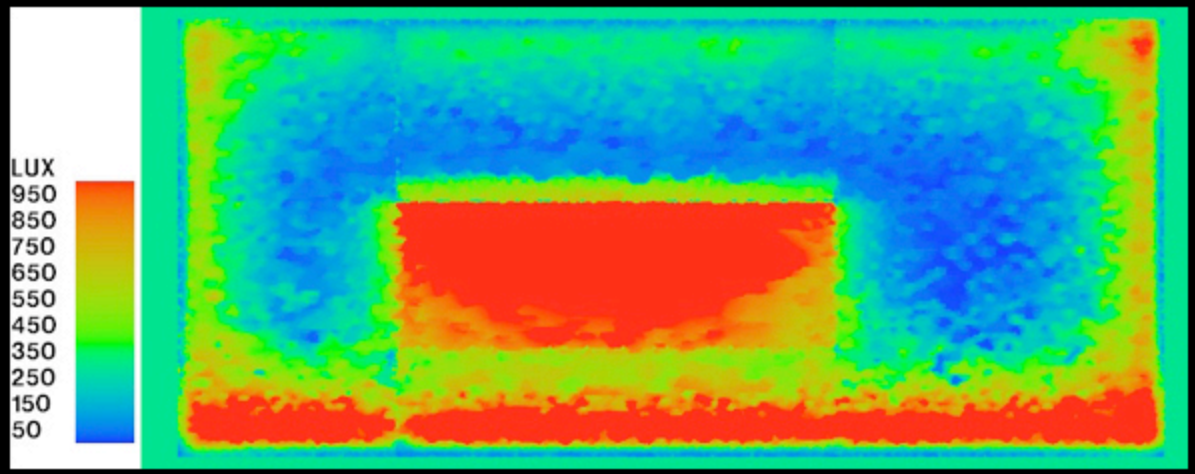


Option 2
Total floor area: 12420 m2
Glazing percentage: 29%

LEED Canada Credit 8.1
59.6% of floor area > 250 lux
(September 21 - 1200 - clear sky)

Total Energy: 104.5 kWh/m2

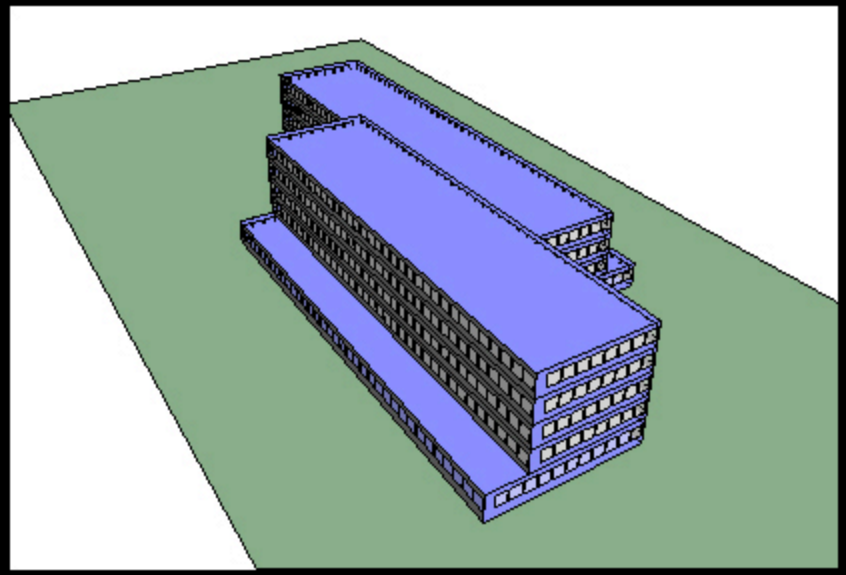
Peak Heating: 2220.0 kW
Peak Cooling: 548.4 kW



Level 1

Children Development Centre - Calgary, Alberta
3 options - Stantec peer review

Stantec

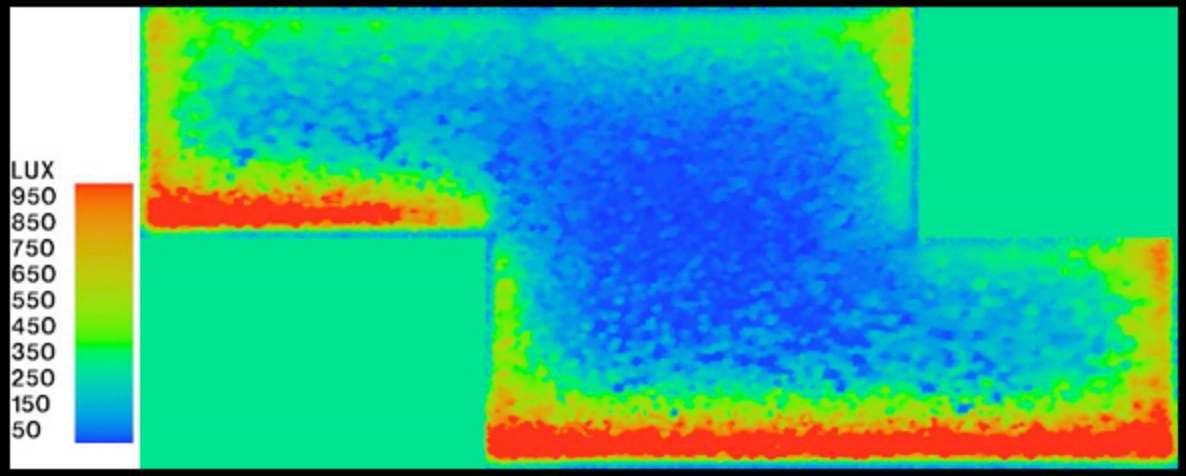


Option 3
Total floor area: 13230 m2
Glazing percentage: 29%

LEED Canada Credit 8.1
53.5% of floor area > 250 lux
(September 21 - 1200 - clear sky)

Total Energy: 98.0 kWh/m2

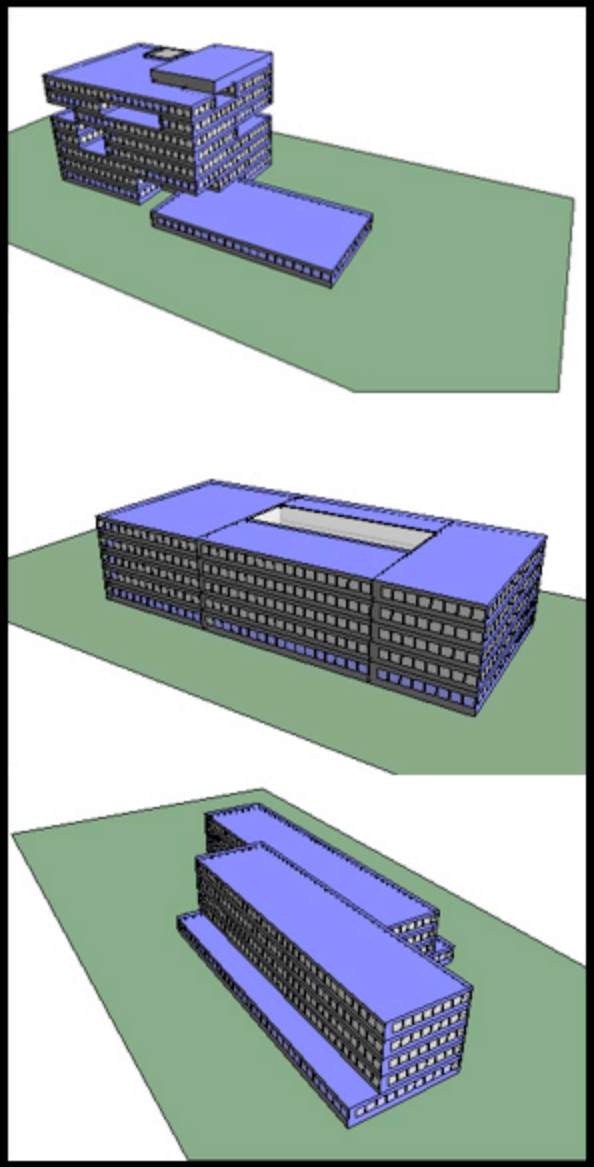
Peak Heating: 2058.5 kW
Peak Cooling: 509.7 kW



Level 1

Children Development Centre - Calgary, Alberta
3 options - Stantec peer review

Stantec

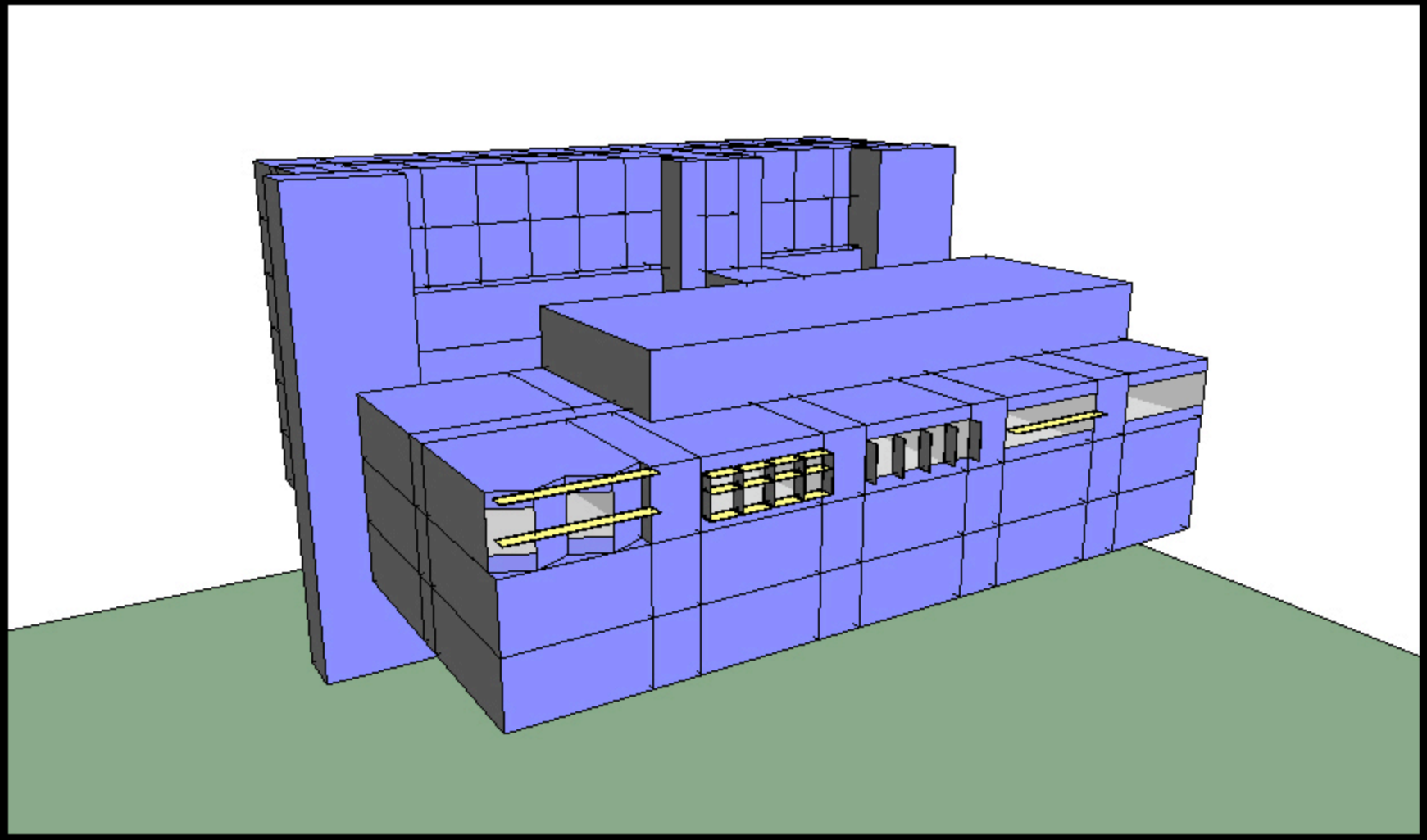


Total Energy (kWh/m2)	Daylight (>250 lux)	Peak Heating/ Cooling (kW)
102.5	43.4%	2202.6/ 459.2
104.5	59.6%	2220.0/ 548.4
98.0	53.5%	2058.5/ 509.7

Children Development Centre - Calgary, Alberta

3 options - Stantec peer review

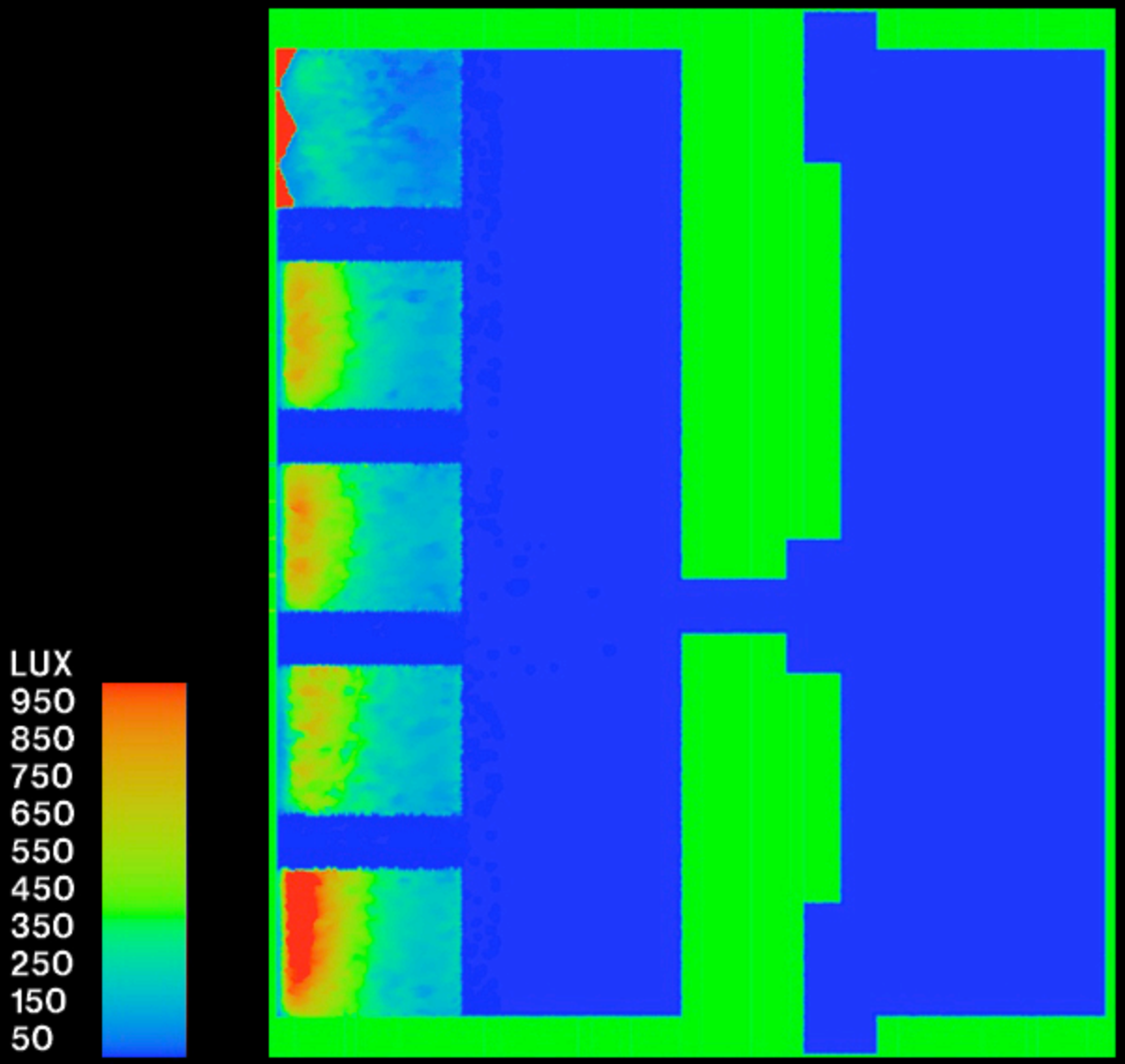
Stantec



Vancouver Community College - New Building- Vancouver, BC

Daylighting Studies during schematic design

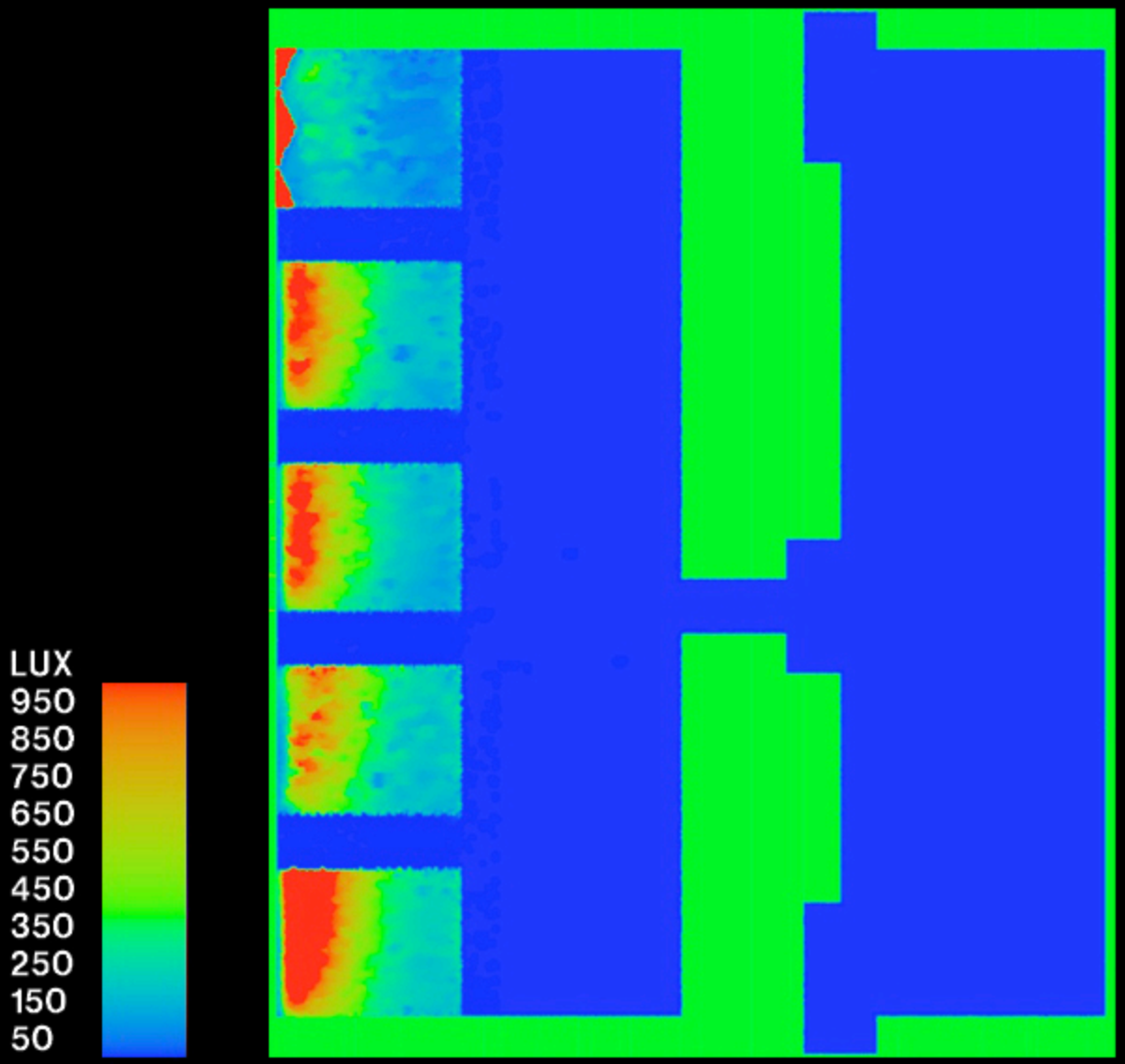
Stantec



Vancouver Community College - New Building- Vancouver, BC

August 21 -1200 - Clear Sky

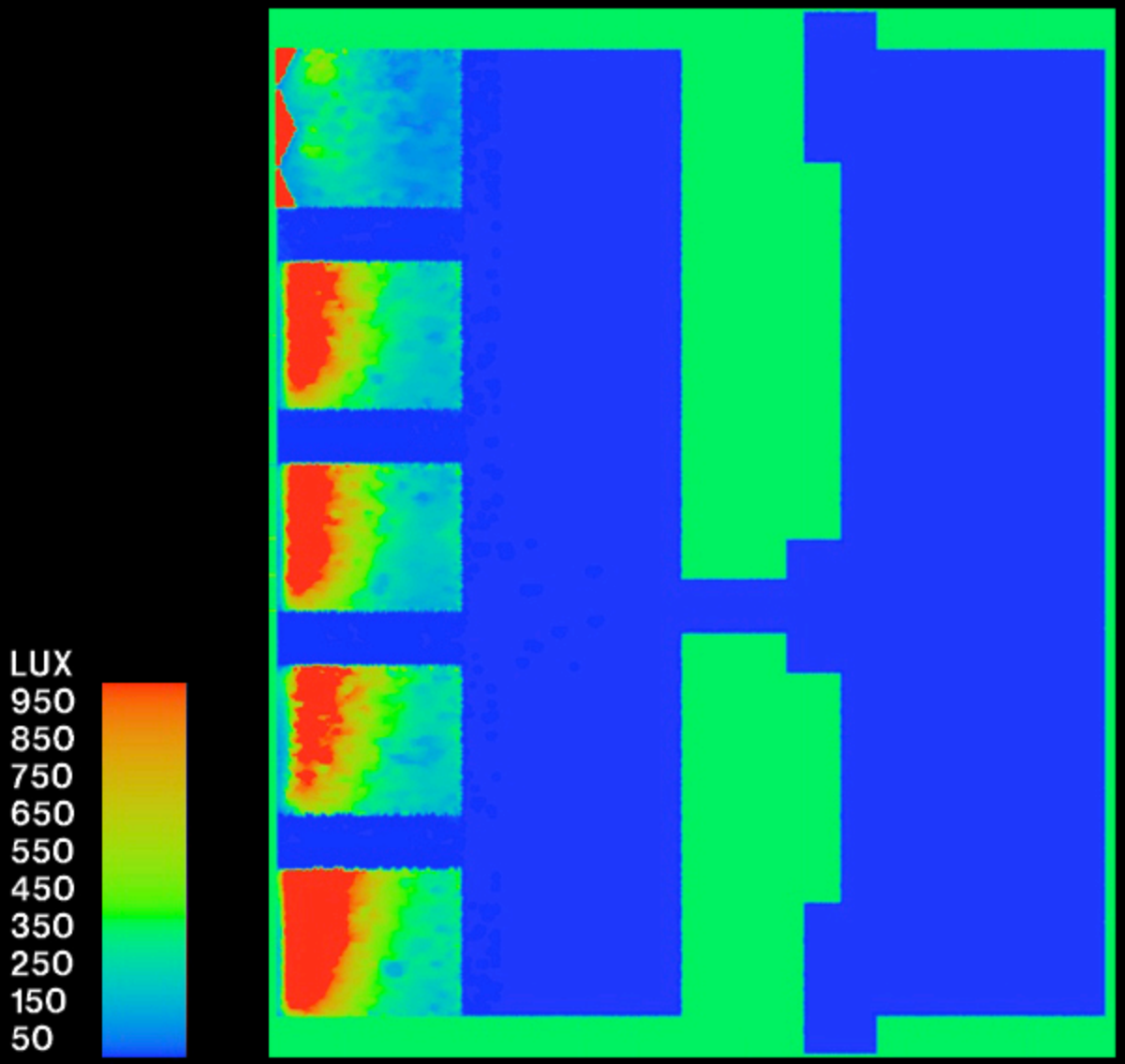
Stantec



Vancouver Community College - New Building- Vancouver, BC

August 21 -1300 - Clear Sky

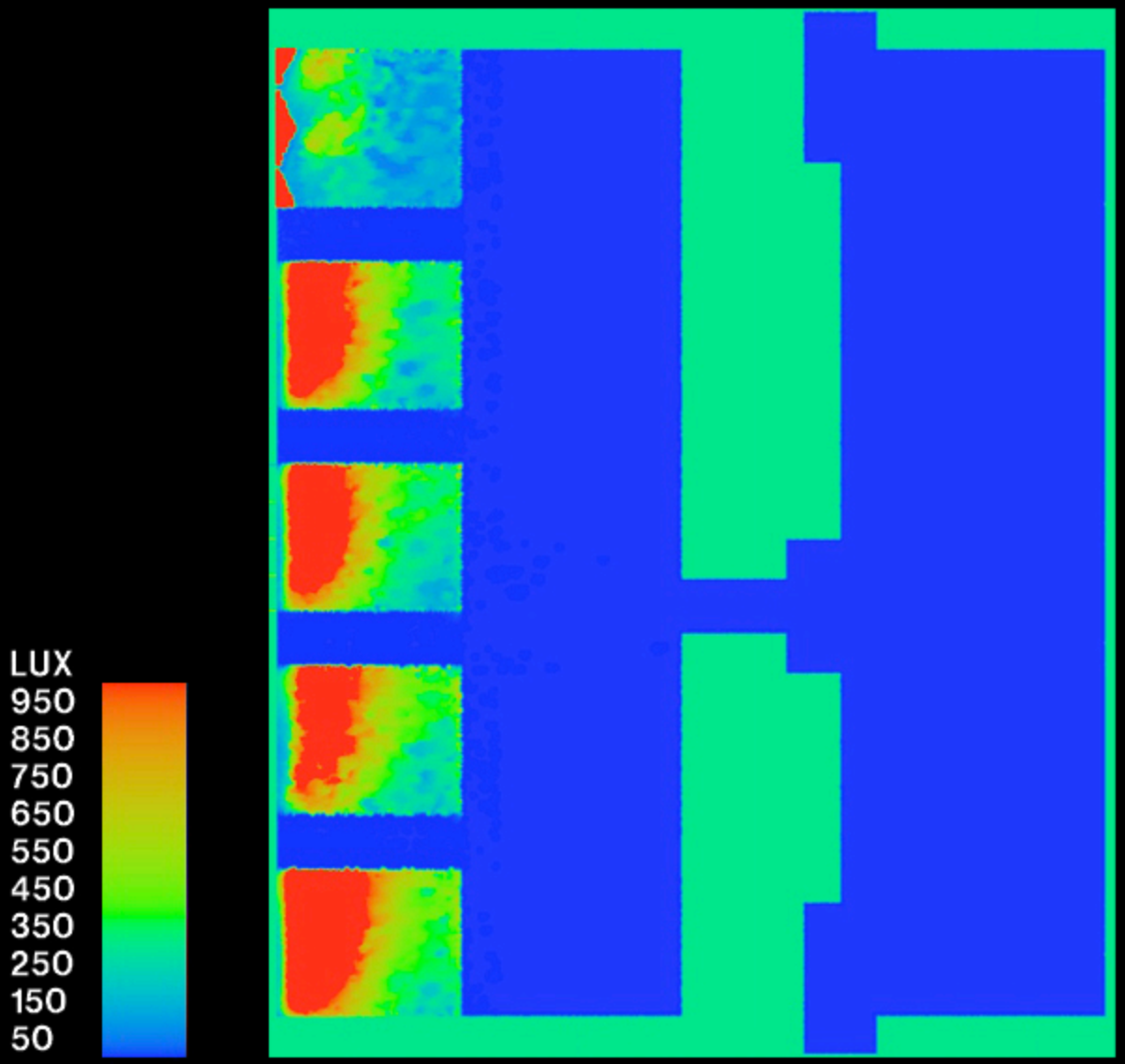
Stantec



Vancouver Community College - New Building- Vancouver, BC

August 21 -1400 - Clear Sky

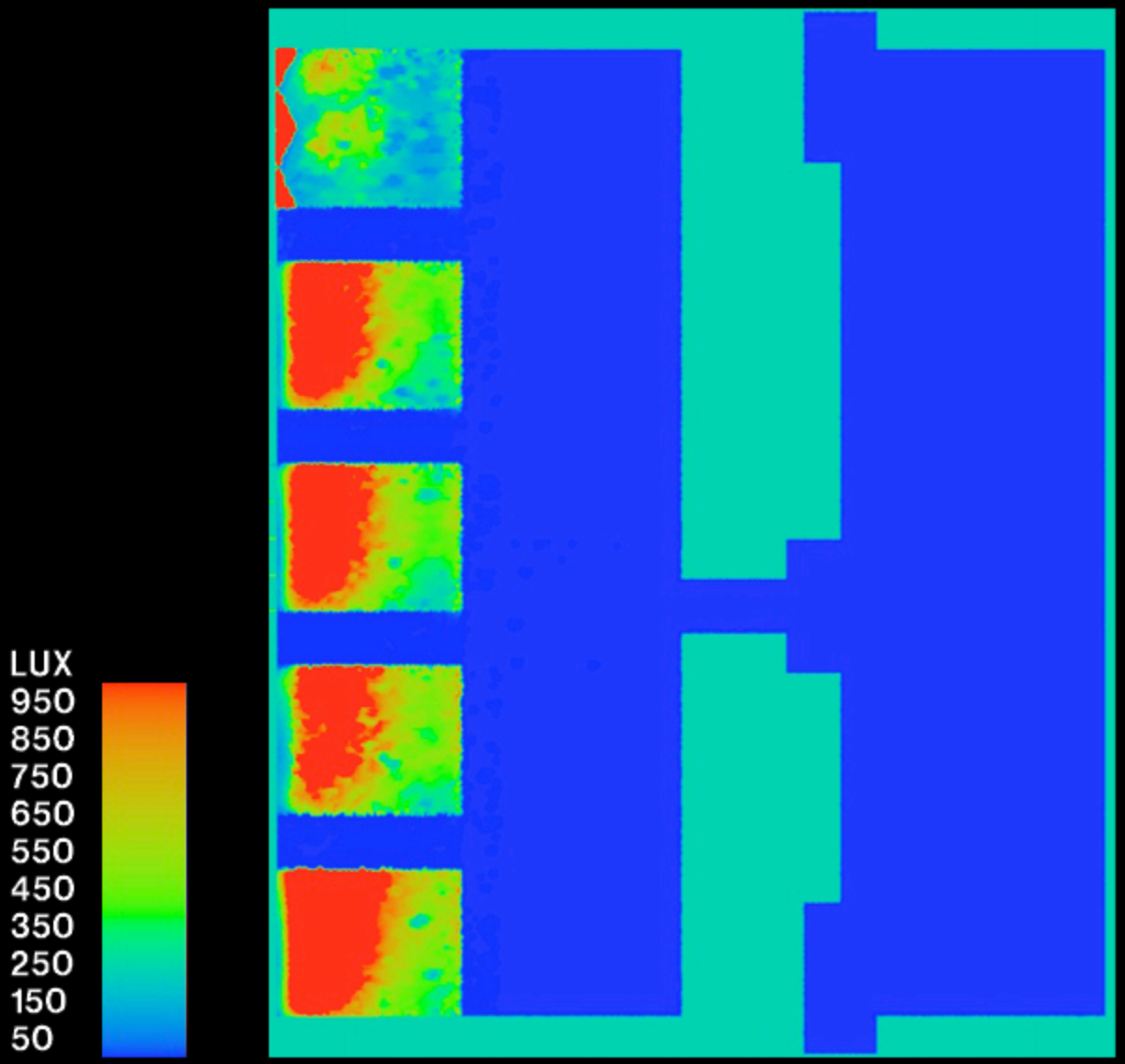
Stantec



Vancouver Community College - New Building- Vancouver, BC

August 21 -1500 - Clear Sky

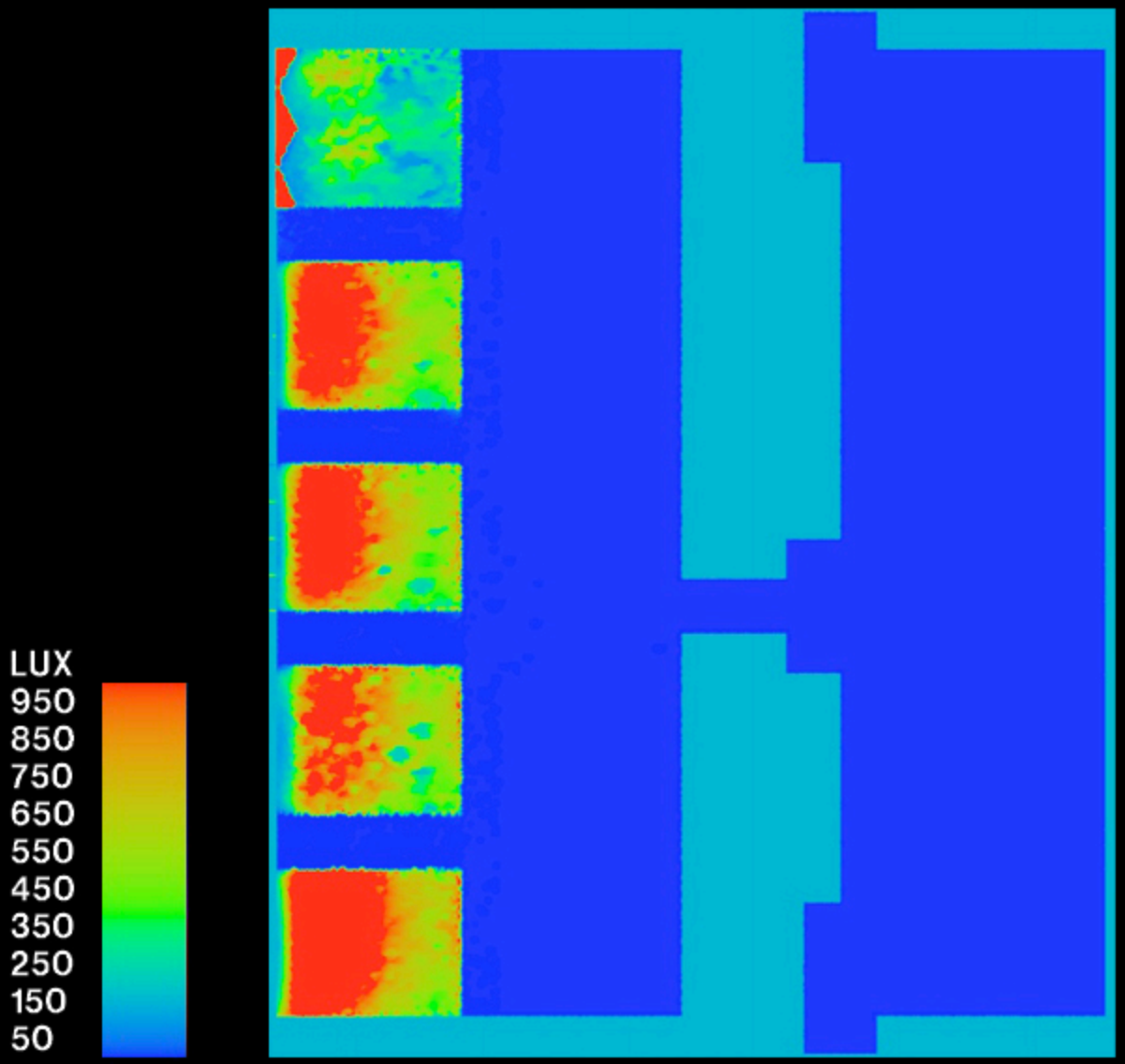
Stantec



Vancouver Community College - New Building- Vancouver, BC

August 21 -1600 - Clear Sky

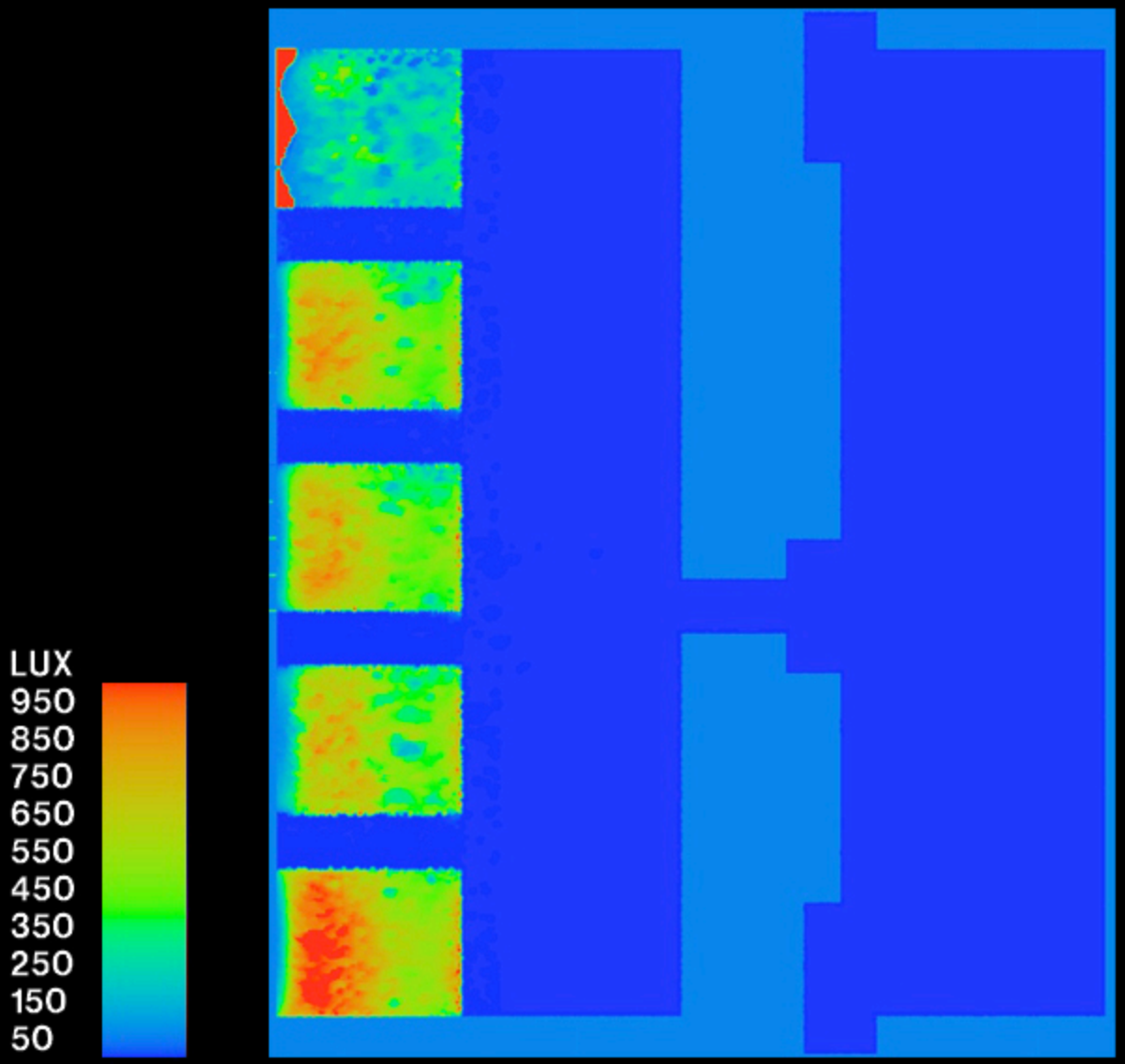
Stantec



Vancouver Community College - New Building- Vancouver, BC

August 21 -1700 - Clear Sky

Stantec



Vancouver Community College - New Building- Vancouver, BC

August 21 -1800 - Clear Sky

Stantec