LINE OF LIGHT

CONCEIVED AS THE 'LINE OF LIGHT," STATION ILLUMINATION FOLLOWS TWO SIMPLE STRATEGIES: LINEAR LIGHTING TO REFLECT DIRECTION OF TRAVEL AND ROUND DOWNLIGHTS TO DENOTE TRANSITIONS.

Story: Craig DiLouie
Photography: Charlie McLarty

CANADA LINE

Projects: Canada Line Transit BC
Client: Canada Line Rapid Transit Inc. (CLCO)/SNC-Lavalin
Location: Vancouver, British Columbia
Architects: Busby Perkins + Will, Walter Francl Architect Inc., Hotson Bakker Boniface Haden Architects + Urbanistes, Hywel Jones Architect Limited, Kasian Architectural Interior Design and Planning Ltd., Stantec Architectural Ltd., Via Architecture
Electrical Engineers: Genivar, Stantec, MCW Consultants Ltd.
Lighting Designer: Total Lighting Solutions
Lighting Representative: Interlite Sales, SLS Lighting

Challenge:
Canada Line, one of the country's largest infrastructure projects, planned a new line with 16 stations and 19 kilometers of track just in time for the 2010 Winter Olympics in Vancouver. Recognizing the importance of lighting in supporting public safety, fostering perceptions of brightness and enhancing wayfinding, SNC-Lavalin engaged Total Lighting Solutions to produce a master plan and later, detailed design for all stations.

Solution:
Total Lighting Solutions produced a master plan that incorporates contemporary best practices and master lighting concept that formed a framework for lighting designs for all 16 stations. The lighting design supports the Canada Line brand and improves brightness, visual comfort and perception of safety. A limited vocabulary of luminaires and lamps ensured easier installation and ongoing maintenance. Finally, the design is highly efficient, resulting in a lighting power density 36% lower than the ASHRAE 90.1-2004 energy standard.

VANCOUVER'S CANADA LINE rapid transit system, completed three months ahead of schedule in August 2009—well in time for the 2010 Winter Olympics—is one of the largest infrastructure projects in Canada. Projected to carry 100,000 passengers every day—up to 130,000 during the Olympics—the system's 16 stations and 19 kilometers of track connect the region's growing residential, business, healthcare and educational centers as well as the city's port, convention center and airport.

The contract for construction, operation and maintenance for the $2 billion project, partially funded by the governments of Canada, British Columbia and Vancouver, as well as the Vancouver Airport and the Greater Vancouver Transportation Authorities, was won by engineering and construction firm SNC-Lavalin. Recognizing the need for enhanced lighting expertise, SNC-Lavalin turned to local lighting design firm Total Lighting Solutions, which developed system-wide lighting standards and concepts and subsequently detailed individual lighting design for all 16 stations.

"The first step was listening to stakeholders and understanding the overall project goals," says Galina Zbrizher, IALD, LC, principal of Total Lighting Solutions. "Second step was to identify multiple areas where lighting influences the outcome: These include the public's emotional response to station environments, perception of safety and security, energy use and maintenance and capital costs, to name a few."

Canada Line includes above- and below-ground stations featuring different platform configurations where passenger arrival and departure are compressed into short periods of extreme activity in a confined space. Most of the remaining stations' area is dedicated to circulation,

including concourses and vertical circulation—stairs, escalators and elevators—varying 20 to 50 ft. in height.

The project goals included promoting public transit by providing stations that are bright, safe, elegant, environmentally and fiscally responsible, and easy to maintain. Principal lighting design goals included public safety and security, aesthetics, wayfinding and high-quality lighting. Although not mandatory, a high level of energy efficiency was valued.

Zbrizher says it quickly became clear that new lighting design standards would be needed to properly address these goals. The existing lighting standards, based on the preceding Millennium Line, which were at least a decade old, contained outdated light levels and did not include best practices that take into account all elements of the visual environment, such as role of uniformity, vertical illumination and reflectance of materials.

"As many standards of yesteryear do, they propagated 'more is better,'" she adds.

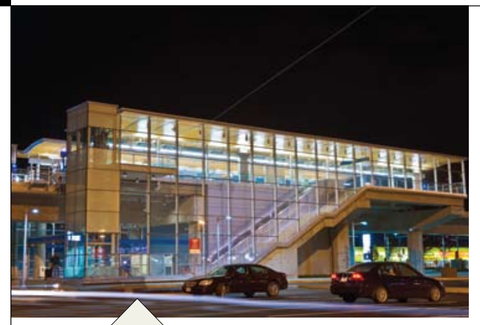
The new lighting standards include updated horizontal and vertical light level recommendations and specify reflectance values that address lighting quality as well as quantity—factors such as visibility, uniformity, visual comfort and glare control.

"One of the goals was to achieve a perception of brightness and safety," says Zbrizher. "To this end, we wanted to ensure high wall luminance and good vertical illuminance criteria and stipulating high-reflectance values for all surfaces in the finishes section, thus integrating architecture and lighting. In addition, to ensure good visibility, the new design manual stipulates high uniformity within the stations and makes provision for day and nighttime settings to allow for adaptation between high and low light levels in transition zones—i.e., between light levels in below grade station interiors to exterior light levels."

Working with Chris McCarthy of SNC-Lavalin, the project manager, and Allen Parker of Allen Parker Consulting, the architectural design manager, Zbrizher made a case for ensuring that the lighting would be a consistent element for all stations, which was accepted. The next step, therefore, was to develop an overall concept, or big idea, for the lighting on the Canada Line that could be scaled and applied to detailed design for all 16 stations. This proved particularly challenging as the stations were given distinctive designs by seven different architectural teams.

"This decision served a number of purposes," says Zbrizher. "It's a strong branding tool that makes stations and entrances to the stations easily identifiable in the busy urban settings, surely appreciated by hundreds of thousands that visited Vancouver for the Olympics. It's a strong wayfinding tool with repeated circulation patterns that makes orientation intuitive. It created economy of scale by using a limited palette of luminaires. And it simplified maintenance by reducing the number of lighting equipment components."

The overall lighting concept was "Canada Line: Line of Light." Linear luminaires were oriented in the direction of travel. In areas that required visitor attention, such as transition to a fare-paid zone and

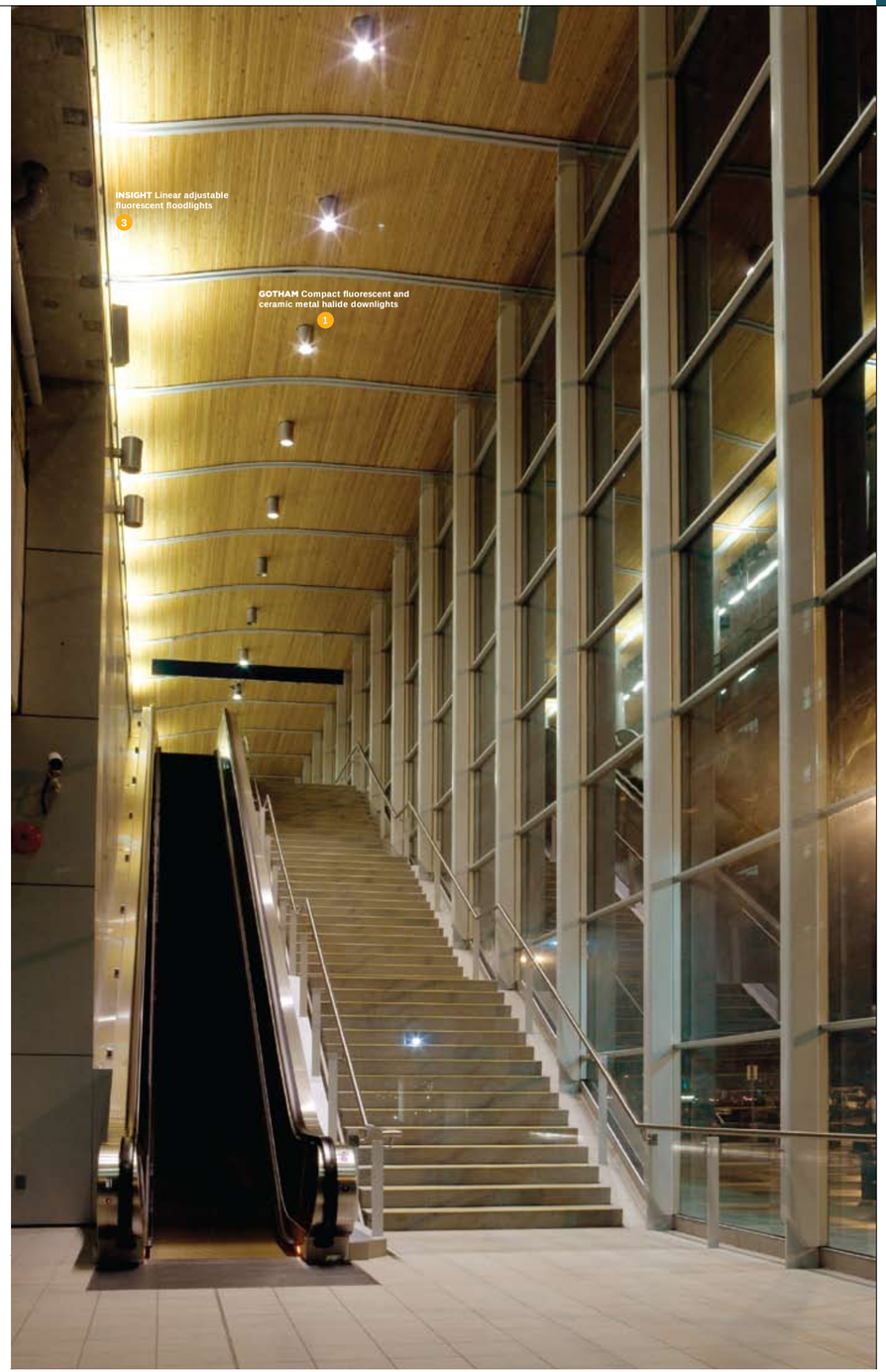


MORE IS NOT BETTER ▶
New lighting standards include updated horizontal and vertical light level recommendations and specify reflectance values that address lighting quality as well as quantity—factors such as visibility, uniformity, visual comfort and glare control.

BEST PRACTICES (ABOVE)
Provisions were made for day and nighttime settings to allow for adaptation between high and low light levels from the below-grade interiors to the exterior platforms.

INTEGRATION (ABOVE)
The project was a true integration of lighting and architecture as high-reflectance surfaces were specified for finishes to ensure good illuminance criteria.

BELOW: The project goals included promoting public transit by providing stations that are bright, safe, elegant, environmentally and fiscally responsible and easy to maintain.



change of elevation at the stairs, groupings of round downlights were used to interrupt the linear lighting arrangement. Changing the appearance of the luminaires and creating a pool of light draws visitor attention to these spaces.

"Distilling the lighting concept to two simple strategies allowed application of the overall concept to the distinct architecture of the stations, maintaining continuity of the lighting as a design and branding element, while maintaining enough flexibility to customize final layouts and luminaire selection to each station's architecture," Zbrizher points out.

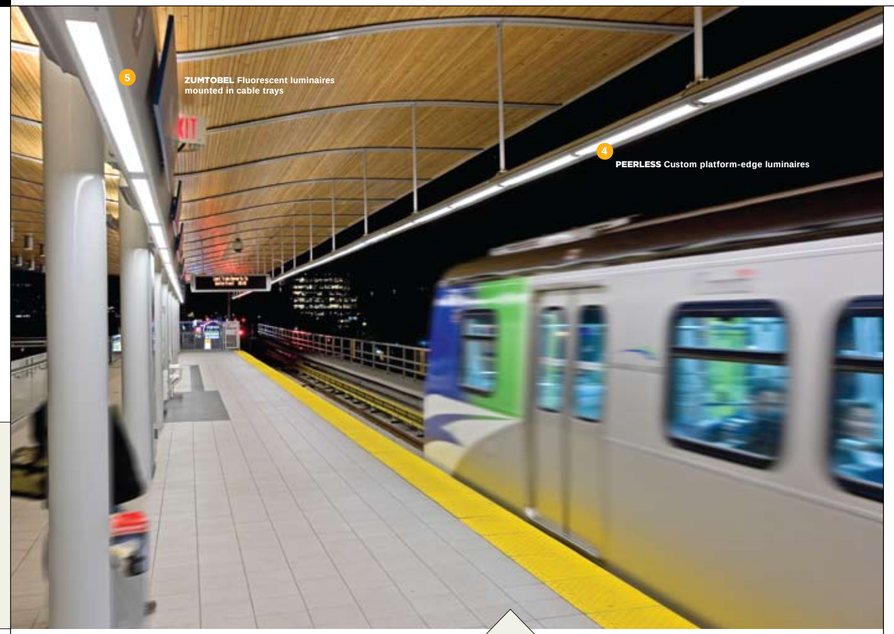
MISSION ACCOMPLISHED ▶
"It's very satisfying for us to know we've accomplished our client's goal of building a transit system that the public sees as bright, where people feel safe, and that promotes the use of public transportation."
—Galina Zbrizher

The project was further simplified by providing designs for all 16 stations based on only six luminaire families and five lamp types (plus LED), an extraordinary measure that simplified installation and maintenance while minimizing visual noise. A custom platform-edge luminaire was designed in collaboration with Peerless Lighting to gain needed performance and used throughout the system. With only one lamp in section, this direct/indirect luminaire achieves 20 footcandles of horizontal illumination on the platform edge and uniform vertical and horizontal light levels for the least amount of energy. It is compact and attractive and blends well with the architecture.

The project was delivered on budget and ahead of schedule. While not required, the lighting design minimizes energy consumption through energy efficient technologies, efficient design and daylight harvesting, resulting in an overall lighting power density of 0.64 watts per sq. ft., 36% less than the ASHRAE 90.1-2004 energy standard's 1 watt per sq. ft. With 20/7 operation, energy savings top 1.5 million kWh, which earned a $120,000 utility rebate.

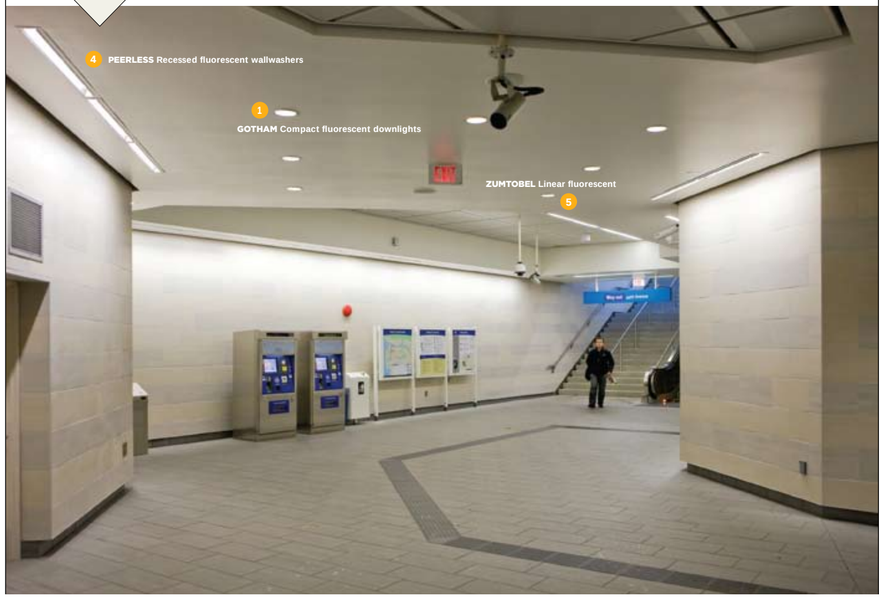
"Canada Line is a complex project built on a tight schedule," says Zbrizher. "It's very satisfying for us to know we accomplished our client's goal of building a transit system that the public sees as bright, where people feel safe, and that is dignified and promotes the use of public transportation."

She adds that there are important lessons in this projects about what makes a successful master plan. "A successful plan provides a framework for lighting design. It clearly identifies goals, provides understandable design criteria and includes design considerations and standards for horizontal and vertical illuminance, uniformity ratios, luminance ratios, material reflectances and glare control."



TRANSITION (BELOW)
The overall design follows a simple pattern: linear lighting to reflect areas of travel and round downlights in transitional areas such as ticketing areas.

UNIFORMITY (ABOVE)
Zbrizher made a case for making the lighting a consistent element, requiring a big idea that could be scaled and applied to all 16 stations.



SHARP AND SAFE (BELOW)
The resulting lighting design for each station supports the Canada Line brand and improves brightness, visual comfort and perception of safety.

EFFICIENT (ABOVE)
The project was further simplified by basing the designs on only six luminaire families and five lamp types, plus LEDs.

Lighting Designer: Total Lighting Solutions, www.lightingdesign.ca, **Circle 223.**

PRODUCTS USED
B-K Lighting (accent lighting), www.bklighting.com, **Circle 222.**
Delray Lighting (ambient lighting and downlights), www.delraylighting.com, **Circle 221.**
1 **Gotham** (downlights), www.gothamlighting.com, **Circle 220.**
2 **Hydrel Lighting** (accent lighting), www.hydrel.com, **Circle 219.**
3 **Insight Lighting** (ambient lighting), www.insightlighting.com, **Circle 218.**
4 **Peerless Lighting** (ambient and platform edge lighting), www.peerless-lighting.com, **Circle 217.**
Se'lux (ambient lighting), www.selux.com, **Circle 216.**
Sistemalux (downlights), www.sistemalux.com, **Circle 215.**
5 **Zumtobel Lighting** (ambient lighting), www.zumtobel.us, **Circle 214.**