



INTEGRATED DESIGN YIELDS EFFICIENCIES

Vancouver International Airport Station—photo by Charlie McLarthy

MOST STORIES ABOUT ENERGY-EFFICIENT LIGHTING ARE ABOUT TECHNOLOGY. BUT FOR THE CANADA LINE RAPID TRANSIT PROJECT, THE EMPHASIS ON EFFICIENT LIGHTING STARTED LONG BEFORE THE FIXTURES WERE CHOSEN.

The story of the award-winning lighting in the Canada Line Rapid Transit Project begins with the design process. As the design team started work on the rapid transit line that would link downtown Vancouver with Richmond and Vancouver International Airport, an emphasis on safety framed many design decisions, including required high visibility and high quality of light.

“We had eight underground stations to design and build, and we knew the quality of the public space and sense of personal safety would be strongly influenced by the effectiveness of lighting,” says Chris McCarthy, SNC-Lavalin’s Director of Fixed Facilities and the project’s stations design manager. “Plus, there are lighting safety issues related to specific areas, such as the platform edge. Thus, good lighting was critical.”

That led to a discussion about what constitutes “good” lighting. “In some cases, previous transit examples focused too much on lighting output and not enough on distribution and uniformity,” says McCarthy. “We toured facilities to experience both good and poor lighting. We measured extremes, where unevenness led to lighting levels varying from 100-foot candles to less than ten in the space of a few metres. You can have a lot of light but still not feel comfortable in a space.”

Seeking a better solution, the design team refined the lighting design criteria to save energy and improve quality. With the help of lighting designer Galina Zbrizher, Principal at Total Lighting Solutions, the team requested a revision to the lighting design criteria.

“Good lighting is about the quality of light, not the quantity,” says Zbrizher. “Instead of addressing only one element of lighting—the number of foot candles—our approach was holistic. We focused on achieving high uniformity with good vertical luminance and absence of glare, which in combination with light-coloured finishes, created a perception of brightness. This approach allowed us to build brighter stations while reducing light levels in most areas, with the exception of platform edge, where a high light level is essential.” This design approach, in combination with using the highest efficiency technologies and daylight harvesting, created an annual electrical energy savings of 1.5 GWh for the 16 stations, compared to previous transit developments. The incentive from the BC Hydro New Construction Program made the innovative design achievable.

DESIGN TEAM

Design Lead:

- SNC-Lavalin

Lighting Design:

- Total Lighting Solutions

Electrical Engineers:

- GENIVAR
- MCW Consultant
- Stantec Consulting Ltd.

Architects:

- DIALOG
- Hywel Jones Architect
- Kasian Architecture Interior Design and Planning
- PBK Architects
- Perkins + Will Canada
- Stantec Architecture Ltd.
- VIA Architecture
- Walter Francl Architecture Inc.

QUALITY, UNIFORMITY, AND EFFICIENCY

By establishing quality of light as a key goal from the outset, the integrated design team ensured that all design elements would support the goal. Materials for the walls, floors and ceilings were carefully selected with high reflectivity to create a brighter space. Daylighting was used extensively in above-ground stations and where possible in approaches to underground stations. To achieve a high light level along the platform edge and to provide ambient light on the platform, a custom light fixture was developed for all platform edges. The sophisticated optical design of the fixture meets the specified lighting performance goal while using only a single fluorescent lamp per section, instead of the two to three lamps required by standard platform edge fixtures. By directing light only where it's needed and by reducing wasted light, this new fixture saves two to three times the amount of electricity to light the platforms, compared to standard lighting systems.

Finally, the entire lighting system, with more than 3,500 individual lights on Canada Line stations, uses only six lighting fixture types and only five lamp types. "Efficiency is not just about the energy that will be directly consumed by the project," says Zbrizher. "It's also the energy spent during its life cycle: manufacturing of equipment that would need to be transported, installed, maintained and eventually disposed of."

Zbrizher credits BC Hydro's involvement with helping to ensure that the efficient design was adopted. "With BC Hydro supporting the customer and providing an incentive to build a more energy-efficient project, the customer was able to make better use of public money. BC Hydro definitely helped to bring the project forward, to save energy in a way where everybody benefited."

Looking back, McCarthy says addressing lighting early in the design process improved the Canada Line Project in numerous ways, from the quality of the experience in the stations, to the savings on energy. "Quite often lighting gets somewhat left behind in the design development phase and deferred to the detailed design phase. But to me, it's something that should be considered right up front in the preliminary design approach; get the light levels right, get the distributions, and integrate them with the spatial volumes and architectural finishes for optimization. Pull all of these elements together and you will achieve an all-encompassing and holistic solution."

"I was once asked if you could have both efficiency and good design," says Zbrizher. "But good design is energy-efficient. The end result is not only to save energy. It's to supply the most livable and energy-efficient space possible."

POWER SMART NEW CONSTRUCTION PROGRAM

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From finishing materials to lighting placement, the Canada Line's integrated design has efficiency built in.

"The thing that people don't understand about light is that so much is about the eye and human perception," says project manager Chris McCarthy. "When you get the lighting designers working with good architectural teams and good engineers, it's amazing the solutions that come up."

ENERGY-EFFICIENT LIGHTING DESIGN ELEMENTS

- emphasis on quality of light, not quantity
- extensive use of reflective materials for ceilings, walls, and floors to make the most of light
- limited number of fixture types (6) and only 5 lamp types used, to improve maintenance, maximize purchasing efficiency, provide consistent appearance and user experience throughout life of the project, and reduce operating costs
- custom fixtures that maximize exact placement of light
- daylight harvesting used where possible; electric light turned off when daylight is sufficient
- controls to reduce light when not needed
- 1.5 Million kWh savings annually

