Offices for Revenue Canada Taxation

Type:	Office Building
Address:	Surrey, British Columbia
Completed:	Fall 1998
Owners:	Public Works and Government Services Canada
Architects:	Busby and Associates Architects
Structural Engineer:	Jones Kwong Kishi
Mechanical/Electrical Engineers:	Keen Engineering
Environmental/Geotechnical:	McLeod Geotechnical
Contractor:	Ledcor Industries
General description:	5-Storey Office Building
Site Area:	6.2 ha
Gross / Useable Floor Area:	11,043 m^2 / 10,025 m^2
Typical Building Population:	500 to 700 plus visitors

Overview

The architectural brief called for modern office accommodation that would blend into the existing streetscape. The floor plate is large, to provide maximum space utilisation and conversion into multiple-tenant usage at a later date. The building was developed through a competitive design-build process.

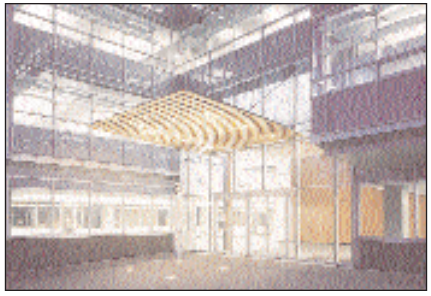
The staggered floor plan permits almost all office areas to have access to daylight, and also provides a net useable-to-gross ratio of 81%, and a net rentable-to-gross ration of 91%. The staggered floor plan maximizes the building perimeter, increasing daylighting potential. Floor plates are large and relatively column-free, facilitating conversion to multiple tenant usage or changes within existing uses.

Structure and Building Envelope Design

The structure is primarily reinforced concrete, with a large floor plate, simple column layout and cantilevers that provide a column-free perimeter zone. Floor-to-floor heights are greater than in comparable buildings, and approximately 95% of floor areas have a ceiling height of 3.05 m. The placement of most services in the access floor permits the underside of the concrete slab to be exposed.

The building envelope is designed according to rain-screen principles, with a continuous air-barrier. All spandrel panels have a thermal resistance of RSI 3.52 or better. The skin of the building is primarily double-glazed, low-E glass, with five different elements. From top to bottom at each floor level there is:

- A clear panel to allow daylight penetration at the light shelf.
- Two clear panels with projecting sunshades .
- The lower of these two windows is operable to provide natural ventilation.
- The two lowest panels are spandrels in two tones of glass to soften the overall elevation.



The view from the garden (above) shows ventilation towers and sunshades. A night shot (below) shows a building entry easily accessible from the street or parking area, and (bottom) an interior detail.

Mechanical Systems

The building has a mixed-mode ventilation system, with both operable windows and a mechanical system providing displacement ventilation. The system also provides free cooling for longer periods of time than a traditional system. An access floor system will permit easy re-arrangement of the under-floor HVAC distribution system and reduces problems associated with employee relocation. Occupants can control the location and air flow of air diffusers at each workstation. Condensing boilers and an air-cooled chiller are specified. An integrated DDC building management computer system controls HVAC and lighting systems.

Summary of Performance Data

Annual Operating Energy Consumption: 634 MJ/m^2 (719 Ref.)
Initial Embodied Energy Consumption: 3,542 MJ/m^2 (3,556 Ref.)
Embodied Greenhouse Gas Emissions: 0.88 equiv. $C0_2$ tonnes/m^2 (structure and building envelope only)

Operating Emissions:		
	CO_2:	18 kg CO_2/m^2/year
	SO_2:	0.0063 kg SO_2/m^2/year
	NOx:	0.0140 kg NOx /m^2/year
	Particulates:	0.0018 (kg part.)/m^2/year

Annual Consumption of Potable Water: 1681 litres/m^2/year

Energy Strategies

A direct/indirect lighting system is integrated with daylight from light shelves and large areas of low-E glazing. Exposed mass concrete provides natural diurnal thermal storage. The mechanical system delivers cooling and ventilation air underfloor. Operations are expected to remain efficient through the use of a high performance DDC control. Annual energy consumption is forecast at 12% less than the MNECB prototype.

Minimizing Impact on Ecosystems

Crushed recycled glass is used as backfill. A storm water overflow tank reduces peak flows. A computer-controlled irrigation system will control water usage for site plantings.

Offices for Revenue Canada Taxation

Efficient Materials Use

The exposed undersides of concrete slabs have only a paint finish, made possible by placing most services under the access floor surface.

Reducing Waste and Use of Materials

There is recycled steel in concrete structure and recycled aluminum in glazing mullions. Interior partitions are re-used from existing stock and carpet consists of mimimum 25% recycled fiber.

Reducing Operating Solid and Liquid Waste

Plumbing fixtures used throughout are specified for low water consumption.

Measures Taken to Reduce Use of Automobiles

36 bicycle parking spaces are provided

Maximizing the Quality of Indoor Environment

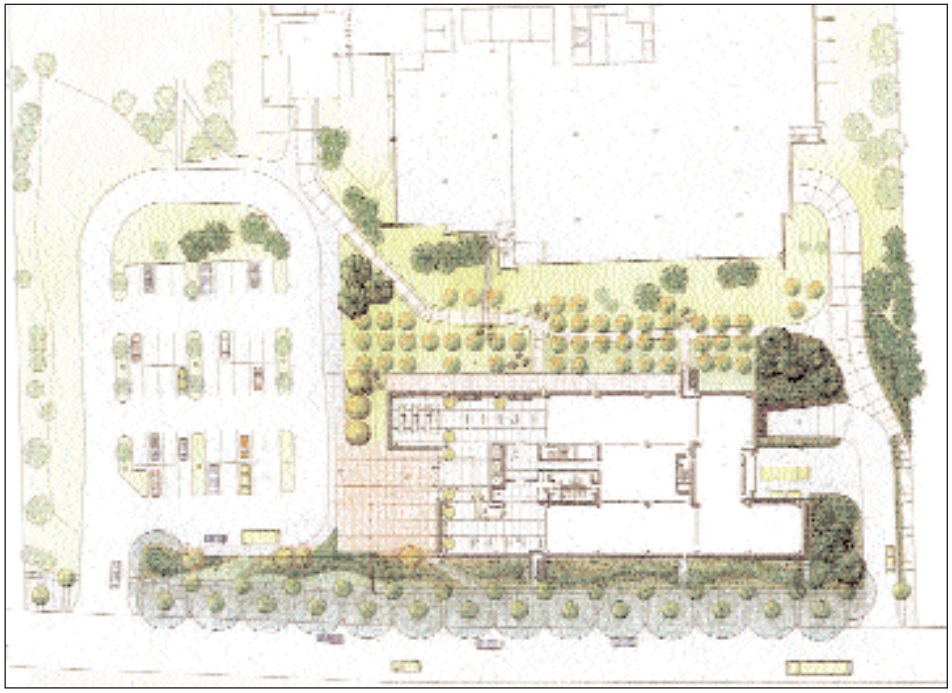
Major emphasis has been placed on indoor environmental performance. Superior indoor air quality is achieved through the provision of operable windows and a mechanical ventilation system that is capable of providing 100% fresh air. An emphasis on daylighting results in 90% of workstations being within 8m of glazing. Light shelves and a high ceiling (95% of the floor area has a 3m clear height) will help to maximize benefit of available daylighting while reducing glare. The lighting system is overhead indirect type, controlled by daylight sensors in the perimeter zones.

Ensuring the Longevity of the Building

The relatively long-span (9m) flat slab structure is adaptable to a wide variety of other building functions.

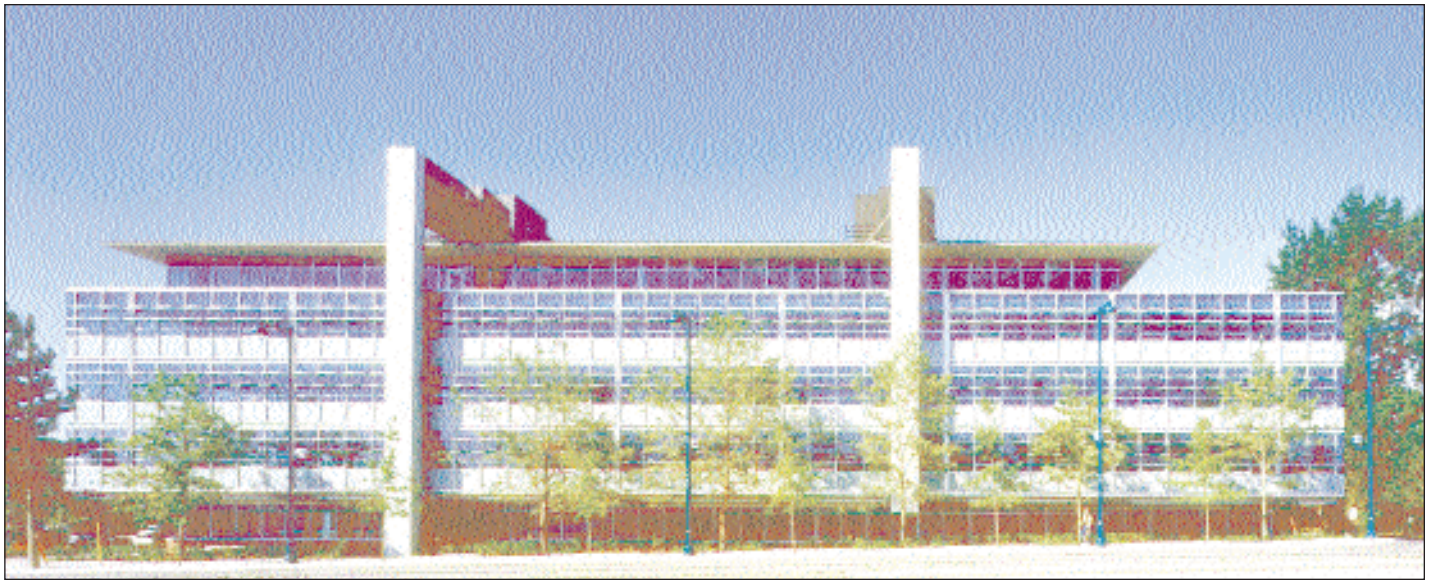
Features of Interest Concerning the Design

Above:
An early construction stage view of the structure

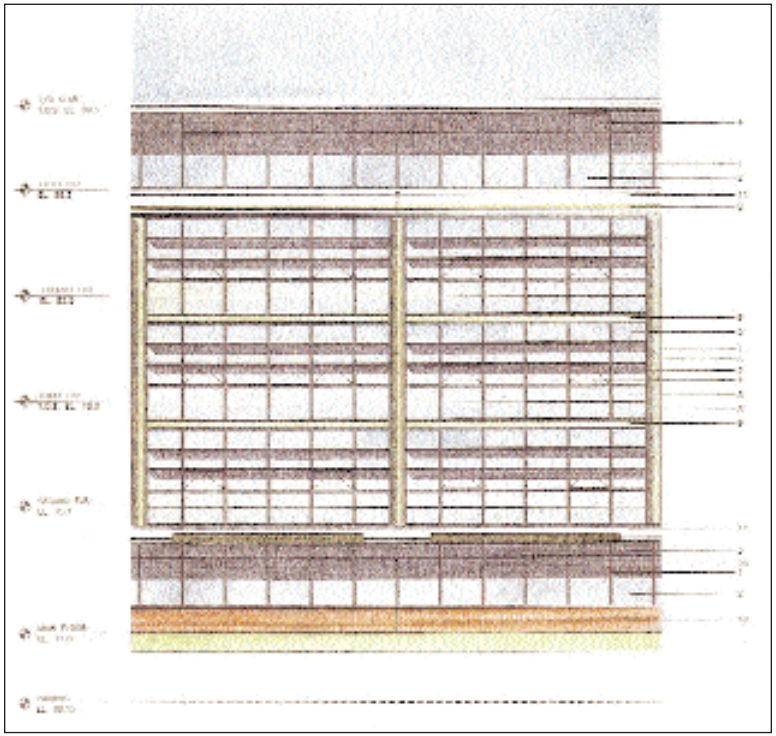


Right:
Site Plan showing landscaped area between the new and existing elements of the building;

Below:
A photo of the East (street side) elevation.

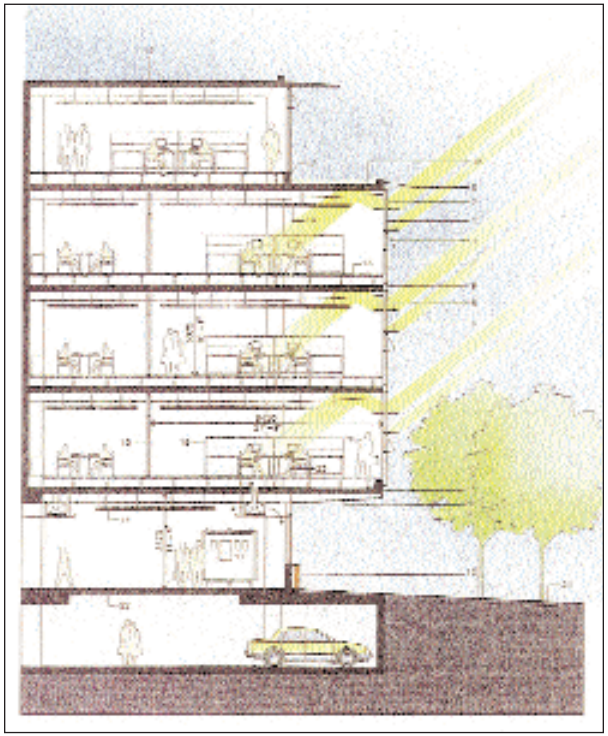


Offices for Revenue Canada Taxation

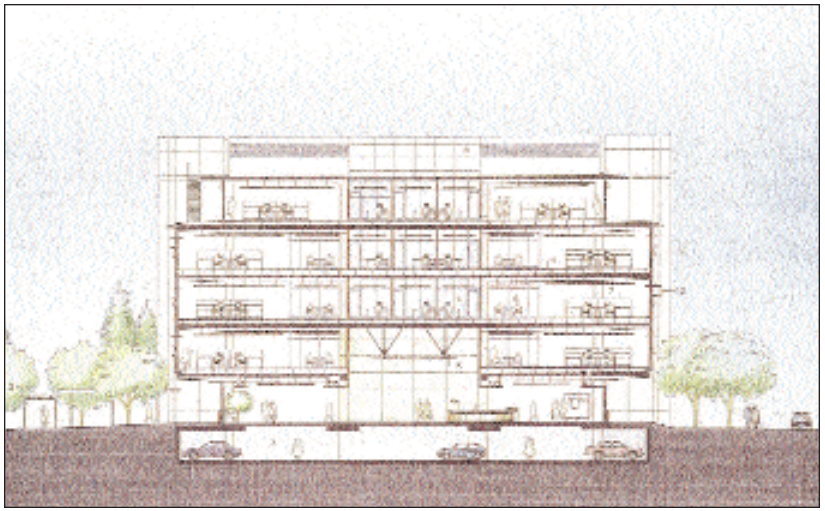


Technical Elevation (left) and Technical Section (Right):

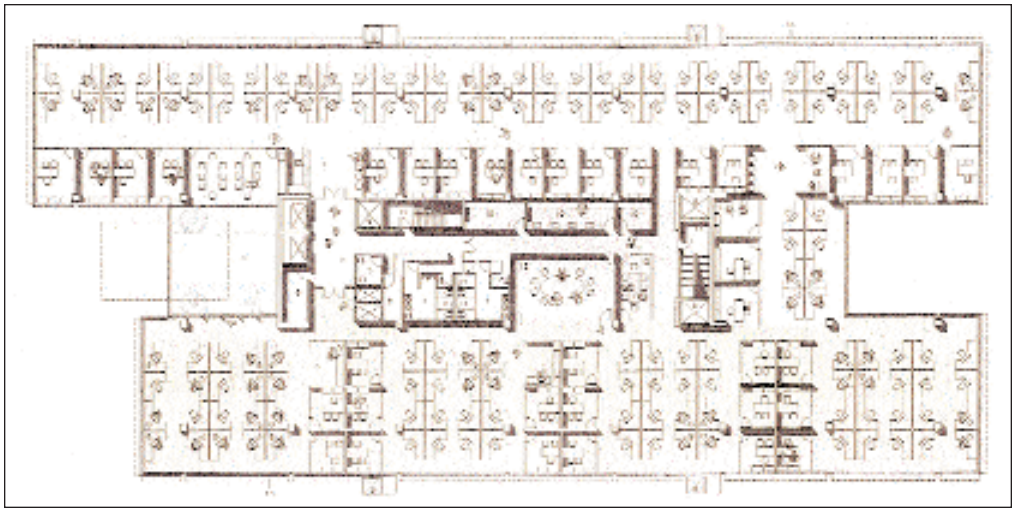
1. Thermally broken aluminum glazing system with clear anodized finish.
2. Double-glazed sealed units with low-E coating.
3. Back-painted glazed spandrel panel with air barrier and R-20 (RSI 3.52) insulated back panel.
4. Double glazed operable window (awning type).
5. Exterior sunshade / light shelf: extruded aluminum louvre with clear anodized finish, semi-transparent glazed lightshelf above.
6. Exterior sunshade: extruded aluminum louvre w. clear anodized finish.
7. Aluminum reveal panel with air barrier and R-10 (RSI 1.76) insulated back panel with “Duranar” finish.
8. Steel window washing rope extension.
9. Aluminum spandrel panel with air barrier and R-20 (RSI 3.52) insulated back panel, clear anodized finish.
10. Red brick in stack bond w. air barrier and R-20 (RSI 3.52) insulation.
11. Exposed concrete with sandblasted finish.
12. Window washing anchors
13. Raised floor



Below left: Building Section



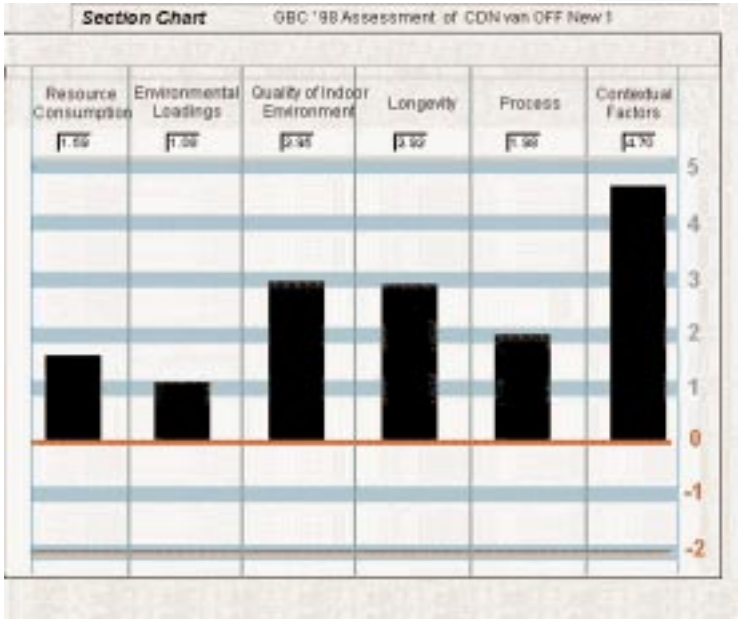
Below: Second Floor Plan

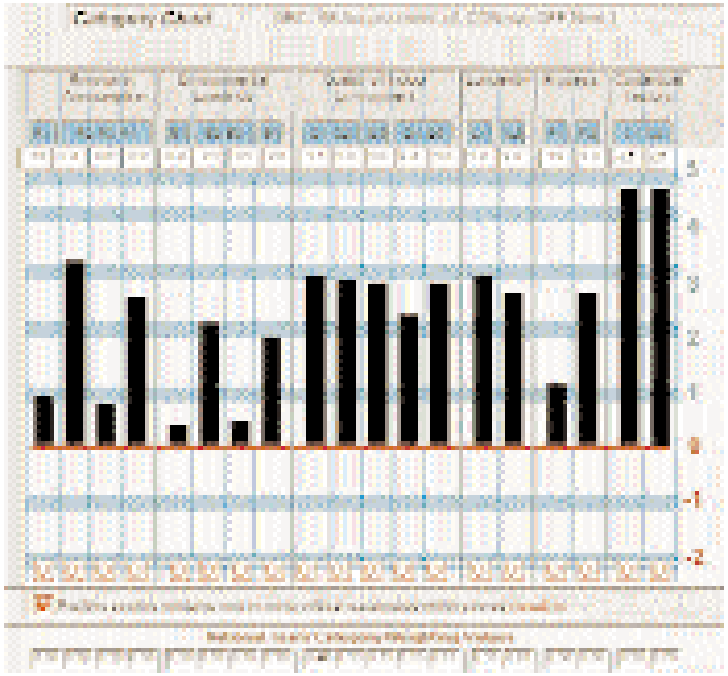


Offices for Revenue Canada Taxation

SW corner

Main entry





Selected Performance Assessment Notes

E1.1.3 CO2 emissions from building operations
Based on total energy saved which is 11%, I scored 0.5
E2.2.1 Potential recoverability and reuse of materials and components
The Consultant's description of recoverable items is fairly standard. I question that it is much different than most buildings of its size and shape. The Reference case 0 value states that "no materials have been consciously designed for recoverability"
E2.2.2 Potential recyclability of materials and components
The consultant's description of potential for recycling is standard practice.
E3.2.1 Peak load on municipal storm water system
There is no calculation on what the % reduction over reference is but scored 1.0 for the holding tank used to reduce peaks and for the choice of soils in the landscaping.
Q1.1.3 Control of standing water in HVAC distribution systems
ASHRAE and SMACNA standards would apply to the Reference HVAC system. The standard is to design for no standing water.
Q1.2.1 Mineral fibre control
ASHRAE and SMACNA standards would apply to the Reference HVAC system. I gave a 1.0 score because of the minimal use of ceiling tiles.
Q2.2.1 Maintenance of acceptable relative humidity during heating season
The climate in Surrey does not call for specific measure to maintain humidity between 30% - 70% during heating season.
Q3.2.1 Illumination levels in workplace areas
Task lighting is used which provides for some individual control.
Q5.3 Capability for personal control over indoor environment
Occupants can control ventilation supply but not supply temperature. Score 3.0
L1.1 Adequacy of floor-to-floor height for future uses
While the building is less than 3.8m floor to floor, it has an exposed ceiling and raised floor system which make it very adaptable. Score 2.0.....