Institution Type: Public
Campus Population: 39,065 (984 faculty, 8958 grad students, 24,947 undergrad students, 4176 staff)
Project Completion: May 2011
Project Occupancy: 2011
Project Cost: CDN $49.4 Million
Construction Cost: CDN $35 Million
Size: 93,385 ft² (usable gross) 63,995 ft² (net programmable)
Site Area: 70,000 ft²
Sustainability Rating: LEED Gold (pending)
Historical Designation: None
Original Construction: Sept 9, 1965
Original Architect(s): Erickson Massey Architects
SITE CONTEXT PLAN

1. Shrum Science Centre, Chemistry
2. Shrum Science Centre, Bio-Sciences
3. Shrum Science Centre, Physics
4. Shrum Science Centre, Multi-Use
5. Academic Quadrangle
6. Strand Hall
7. Halpern Centre
8. W.A.C. Bennett Library
9. Convocation Mall
10. Maggie Benston Centre
LEVEL 8000 GROUND FLOOR PLAN

LEVEL 9000 CONCOURSE FLOOR PLAN

Exterior  Landscaping  Rooftop  Interior
EAST ELEVATION
1. Zinc Panel
2. Architectural Concrete
3. Curtain Wall
4. Capless Fritted Glazing
5. Architectural Metal Louvres
6. Glass Spandrel
7. Laminated Glass & Metal Sunshades
8. Metal Sunshades
9. Curtain Wall C/W Dot Pattern
   Ceramic Frit

WEST ELEVATION
1. Zinc Panel
2. Architectural Concrete
3. Curtain Wall
4. Capless Fritted Glazing
5. Architectural Metal Louvres
6. Glass Spandrel
7. Laminated Glass & Metal Sunshades
8. Metal Sunshades
9. Metal Cladding
SOUTH SECTION

0. Corridor
1. Office
2. Meeting Room
3. EAD
4. Micro Analysis
5. PD/GS Office
6. Biochem Lab
7. Janitor
8. Analytical/ Physical Wet Lab
9. EPR
10. Equipment
11. Spec
12. Auto Clav
13. Analytical/ Physical Lab
14. XRD
15. Lobby
16. Intermediate Level Isotopes
17. Teaching Lab
18. NMR
19. Biochem E.P. Lab
20. NMR Office
21. Mass Spec Office
22. Mass Spec
23. File Storage
24. Secure Storage

LONG SECTION

0. Corridor
1. Sidewalk
2. Level 8000 Addition
3. Biochem E.P. Lab
4. Mass Spec
5. Synthetic/ Organic Lab
6. Teaching Lab
7. Mechanical
8. Computer Room
9. Instrument
10. Dispensary
11. Chemistry Lab
12. Student Office
13. Charles Walsby EDR
14. Lecture Theatre
15. Control
16. Coats
17. Concourse
SCOPE

In 2009, the Shrum Science Centre Chemistry building renewal was one of the highest priority academic capital projects for SFU Burnaby, and was only made possible by a government ‘Knowledge Infrastructure Program’ grant, (part of a stimulus plan to boost Canada’s economic recovery in the wake of the 2008 economic downturn).

The 102,000 sq ft building was at the end of its life – it did not meet code and was at risk of catastrophic failure in the event of an earthquake; the building envelope was so deteriorated that exterior paneling was disengaging from the building and leakages were common; it was highly inefficient given a lack of sustainability measures; the rigid, outdated interior spaces limited SFU’s ability to implement modern teaching and research methods and equipment so students were being lost to more state-of-the-art schools; piecemeal upgrades over the years had obscured the original design and campus’ organizational principles; and the building compromised SFU’s goal of providing bright, inviting communal gathering spaces that would build a strong Chemistry community.

The renovation had to be achieved within a building not designed to accommodate the required improvements and had to consider the entire Shrum Science complex that includes Biological Sciences and Physics as well as Chemistry. An inflexible, compressed two-year schedule was necessary as the grant had to be spent within a stipulated timeframe, and a modest construction budget had to be stretched to accommodate a larger set of client goals than were funded.
INTEGRATED PLANNING

To ensure success, the team implemented a highly Integrated Design Process involving SFU, all consultants and the Construction Manager at every stage.

A series of in-depth, iterative programming interviews identified requirements and informed the design of optimum spaces for each department.

Following a thorough analysis of the campus context, the team developed a report that detailed overarching Campus Architect objectives and core campus design principles to guide the Chemistry Renew and all future science complex renovations.

Having all key consultants involved throughout ensured issues were identified and resolved early on. On-site engineering analyses were carried out in parallel with architectural design to develop effective strategies for seismic reinforcement, while respecting the existing architectural vocabulary, enhancing spaces to be more flexible, and to increase natural light penetration. During construction, the team held weekly meetings on site to efficiently deal with issues and keep the project on track.

1. Exterior view of auditorium. 2. New undergrad teaching lab. 3. Renovated entries to student lavatories.
IMPLEMENTATION

During the renewal, the entire Chemistry department had to be relocated elsewhere on campus. The project was split into two phases to mitigate disruption, overlapping construction with occupancy. This approach ensured enrollment was not impacted.

Shrum Chemistry is part of an architecturally and materially cohesive campus so material selection had to compliment surrounding buildings and the building’s legacy. Glass, zinc, and concrete were selected, offering both functional and aesthetic benefits. Fritted spandrel glass was installed on the lecture hall blocks to lighten the large, monolithic volumes. Zinc panels, which age to a patina that complements the existing concrete, were used as a rainscreen to protect existing porous concrete walls. Interiors were enhanced with natural materials like slatted wood adding visual ‘warmth’ and glass ceiling details indicate lab entrances and break up long corridors.

Given the schedule, much of the work occurred concurrently. For example, contractors started demolition as the design proceeded. This allowed for more accurate drawings and a better, faster, more cost-effective design as the team could confirm unknowns, problem solve and integrate solutions into the design in real-time.

The project team also employed “Performance Based Seismic Design”, involving highly specialized, site-specific, software-based analysis that accurately captured true building performance. As a result, the upgrade was significantly less invasive than a more standard code-based approach. Further, the material inputs, and demands and detailing were less onerous, cheaper, and had a reduced environmental impact.

1. Bulletin board example with famous Chemist display. 2. Typical corridor.
RESULTS

The building envelope, heating, ventilation and air conditioning systems were entirely replaced. All necessary mechanical, electrical and seismic upgrades were completed and, rather than hiding reinforcement in interior walls that would reduce available program area, the team incorporated new structures into the facade. This created more open interior spaces and larger, more adaptable lab sizes that enable students to work in smaller groups or be part of a larger lecture. It also allowed for the addition of larger windows.

The redesigned laboratory spaces can now accommodate the equipment necessary to deliver state-of-the-art learning and research. Future growth was also considered with additional floors and higher density planned on adjacent rooftops.

Greater transparency between circulation spaces, labs, courtyards and the surrounding landscape was achieved. Features include increased glazing throughout to create more interior views and a sense of activity between common areas and labs; a renovated central staircase with new clerestory which fills the 4-storey core space with natural light; corridors enlivened by a series of bulletin boards that promote gathering and discussion and display images and details about famous chemists; and a new student lounge with floor-to-ceiling windows that faces a dedicated courtyard and is equipped with an end-to-end communal desk with electrical plug-ins and stools.

Sustainability was addressed through strategies such as sun shading, heat recovery and low VOC materials and coatings, (LEED Gold certification is pending).

1. Student lounge viewed from courtyard. 2. Renovated staircase with new clerestory. 3. Student lounge overlooking courtyard.
KEY DESIGN ISSUES

i. Schedule  The schedule was the most demanding design constraint since funding was restricted to a rigid two-year timeline. This necessitated an integrated design process with construction manager, consultants and engineers early on. Rapid, strategic design solutions had to be developed simultaneously as demolition proceeded, with ongoing costing analysis to arrive at the most functional, cost-effective and elegant result possible.

ii. Budget  The project was entirely funded by a federal and provincial government grant. The University approached the project with a long list of goals and, given their many requirements, had requested a grant of $74 million. However, only $49.4 million was approved, so pragmatic design decisions and a rigorous, integrated design process was needed to achieve all goals.

iii. Structural Issues (Seismic)  The existing building did not meet Building Code seismic requirements and had numerous other issues requiring extensive repair. A new structural system entailed new exterior framing, stronger foundations and interior sheer walls.

Failing precast concrete cladding was also replaced with a lighter, seismically secure cladding system.

iv. Academic Program Requirements  A series of programming sessions were conducted to accurately understand present and future space requirements. Functionality and optimum adjacencies were primary considerations. Critical requirements addressed in the design included a contiguous open floor plan undergraduate lab; open research labs to maximize flexibility; locating fume hood-intensive, inorganic labs as high as possible to reduce exhaust runs; keeping sensitive instruments on the ground level to minimize vibration effects, and ensuring the potential for future expansion.

v. Campus Identity & Sense of Place  The new Shrum Chemistry building is integral within the campus, echoing its architectural language while modernizing it with a lighter, more contemporary appearance. Increased transparency between interiors and exteriors allows for views within the building and out to the surrounding campus, grounding users in the expansive natural setting on Burnaby Mountain.

1. (Left & Right) West elevation after renovation.  Winner of 2012 Real Estate Board of Greater Vancouver Commercial Renovation Award.