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# 11

To achieve the ambitious goals set out in our Academic Plan, we have made strategic decisions that maximize the efficiency of our resources — including funding, space, infrastructure and personnel — and lead to an overall strengthening of our financial position.

Total revenue in 2016–2017 grew by 6.0% over the previous year, driven by strong growth in MEng enrolment. Our net revenue, after the deduction of central costs, increased by 6.5% over the previous year. Growing revenue, combined with prudent budgeting and careful fiscal management, facilitated ongoing infrastructure improvements as well as investment in strategic initiatives and funding for planned future priorities.

The Dean’s Strategic Fund (DSF) continues to provide seed funding for projects and collaborations that have a broad impact on our Faculty. These include research collaborations that bring experts together across disciplines to address major challenges, as well as initiatives to enhance the student experience, from improvements to teaching labs and fabrication spaces to new experiential learning programs. In 2017, we committed \$5.3 million through the DSF for a number of initiatives that will be implemented over the next three years.

The Engineering Instructional Innovation Program (EIIP), an extension of the DSF, continues to foster curriculum innovation through strategic investments aimed at enhancing teaching and learning and the overall student experience. The new TEAL Fellows Program supports the design of undergraduate and graduate courses to include active-learning approaches that leverage our Technology Enhanced Active Learning (TEAL) classrooms. In spring 2017, the Faculty announced the inaugural cohort of 23 TEAL Fellows (see p. 28).

In 2016, we created the Dean’s Infrastructure Improvement Fund (DIIF) to support large-scale infrastructure improvements within our Faculty. We also partnered with the federal and provincial governments to invest a total of \$31.6 million in renovations to 89 laboratory facilities across our Faculty over the next two years through the Lab Innovation for Toronto (LIFT) project.

The most significant capital project the Faculty is undertaking is the Centre for Engineering Innovation & Entrepreneurship (CEIE). When the CEIE opens, it will provide a new home for multidisciplinary research institutes such as the Centre for Global Engineering and the Institute for Robotics & Mechatronics, as well as TEAL classrooms, prototyping and fabrication facilities, design studios and dedicated space for student clubs and teams. It will serve as a vibrant hub that will enable us to strengthen our world-leading collaborative multidisciplinary research and teaching enterprise, drive innovation, facilitate entrepreneurship and cultivate global engineering leaders.

## Total Revenue and Central Costs

The Faculty's total revenue and associated costs are reflected in Figures 11.1 and 11.2. Revenue in 2016–2017 grew to \$222.8 million, an increase of 6.0% over 2015–2016, with a compound annual growth rate of 6.6% since 2007–2008.

Total central costs rose to \$99.1 million, a 5.4% increase over 2015–2016, with a compound annual growth rate of 5.2% since 2007–2008. Central costs include the student aid levy, university fund contribution and university-wide costs, which experienced year-over-year increases of 1.9%, 10% and 5.0%, respectively (Figures 11.2 and 11.3). The rise in our student aid levy is part of our commitment to provide need-based assistance. U of T's Student Access Guarantee makes this goal clear: "No student offered admission to a program at the University of Toronto should be unable to enter or complete the program due to lack of financial means." Student aid ensures we continue to attract the very best students regardless of their financial situation.

University-wide costs, which include caretaking, utilities, central human resources, student services, information technology, central library, advancement and research services, to name a few, also increased. Factors included: compensation increases, development of a new student information system, improved wireless access across campus, pension deficit special payments, Provostial academic initiatives, and an enhanced Advancement marketing plan.

When these costs are subtracted from our total revenue, the result is a net revenue increase of 6.5% to \$123.6 million year-over-year, with a compound annual growth rate of 7.9% since 2007–2008.

Figure 11.1 Total Revenue, 2007–2008 to 2016–2017

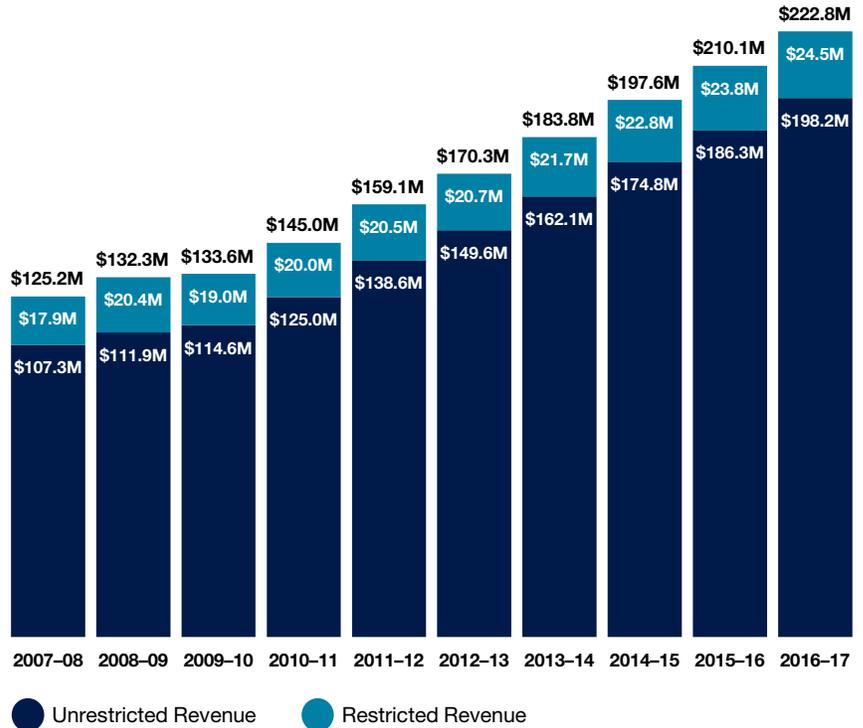
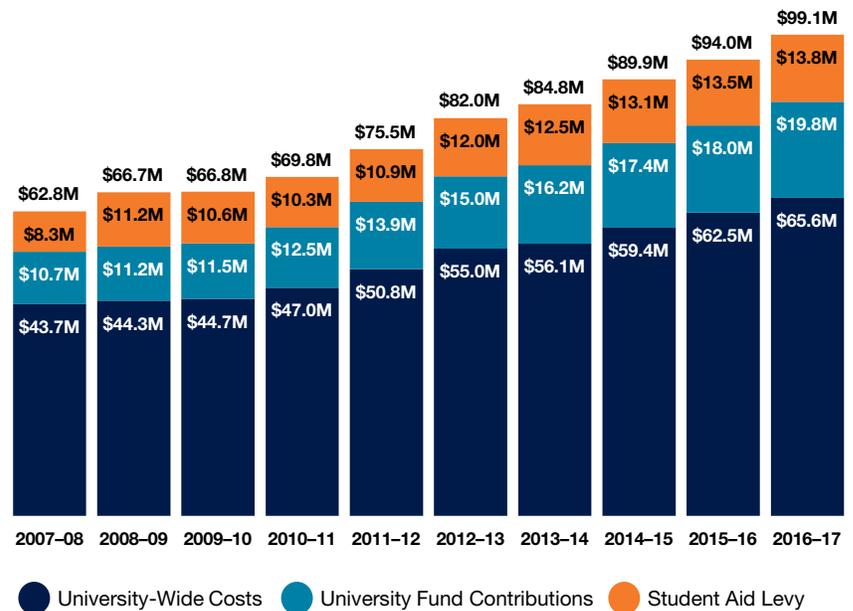


Figure 11.2 Total Central Costs, 2007–2008 to 2016–2017



Data in this chapter are presented by fiscal year (May to April). Selected projects were completed or begun between September 2016 and July 2017.

Figure 11.3 Budget Data, 2007–2008 to 2016–2017

	2007–08	2008–09	2009–10	2010–11	2011–12	2012–13	2013–14	2014–15	2015–16	2016–17
Unrestricted Revenue	\$107,347,671	\$111,937,605	\$114,602,697	\$124,966,518	\$138,597,605	\$149,615,656	\$162,048,175	\$174,819,446	\$186,298,686	\$198,246,669
Restricted Revenue	\$17,885,747	\$20,395,795	\$18,969,092	\$20,009,763	\$20,483,566	\$20,726,973	\$21,737,177	\$22,751,425	\$23,766,755	\$24,525,299
<b>Total Revenue</b>	<b>\$125,233,418</b>	<b>\$132,333,400</b>	<b>\$133,571,789</b>	<b>\$144,976,282</b>	<b>\$159,081,170</b>	<b>\$170,342,629</b>	<b>\$183,785,352</b>	<b>\$197,570,871</b>	<b>\$210,065,441</b>	<b>\$222,771,967</b>
<b>Inter-Divisional Teaching Revenue Transfer</b>									<b>\$6,042,335</b>	<b>\$5,084,764</b>
University-Wide Costs	\$43,698,011	\$44,307,203	\$44,693,620	\$47,027,056	\$50,817,454	\$55,028,273	\$56,089,556	\$59,390,462	\$62,461,112	\$65,553,462
University Fund Contributions	\$10,734,767	\$11,193,761	\$11,460,270	\$12,496,652	\$13,859,760	\$14,961,566	\$16,167,220	\$17,443,377	\$17,985,353	\$19,787,234
Student Aid Levy	\$8,322,264	\$11,166,550	\$10,614,513	\$10,313,864	\$10,859,371	\$11,995,084	\$12,539,417	\$13,093,888	\$13,541,938	\$13,793,571
<b>Total Central Costs</b>	<b>\$62,755,042</b>	<b>\$66,667,514</b>	<b>\$66,768,403</b>	<b>\$69,837,572</b>	<b>\$75,536,585</b>	<b>\$81,984,923</b>	<b>\$84,796,193</b>	<b>\$89,927,727</b>	<b>\$93,988,403</b>	<b>\$99,134,267</b>
<b>Net Revenue</b>	<b>\$62,478,376</b>	<b>\$65,665,886</b>	<b>\$66,803,386</b>	<b>\$75,138,710</b>	<b>\$83,544,585</b>	<b>\$88,357,706</b>	<b>\$98,989,159</b>	<b>\$107,643,144</b>	<b>\$110,034,703</b>	<b>\$118,552,936</b>

## Budget Overview

Our revenue sources, attributed central costs and budget breakdown for 2016–2017 are shown in Figures 11.4, 11.5 and 11.6, respectively. Revenues are up 6.0% year-over-year, driven by solid growth in MEng enrolment and historically higher undergraduate enrolment over the past decade. Government grant revenues have remained relatively stagnant as the grant per domestic student has not changed for a number of years.

The ability to consistently grow net revenue at the Faculty level enables us to pursue renewal objectives, including major strategic initiatives such as the CEIE and the Lab Innovation for Toronto (LIFT) fund matching requirement. Further prudent budgeting and fiscal management across the Faculty have allowed us to fund reserves to meet future commitments, upgrade existing classrooms and laboratories and invest in Dean’s Strategic Fund (DSF) and Dean’s Infrastructure Improvement Fund (DIIF) initiatives.

Figure 11.4 Revenue Sources, 2016–2017

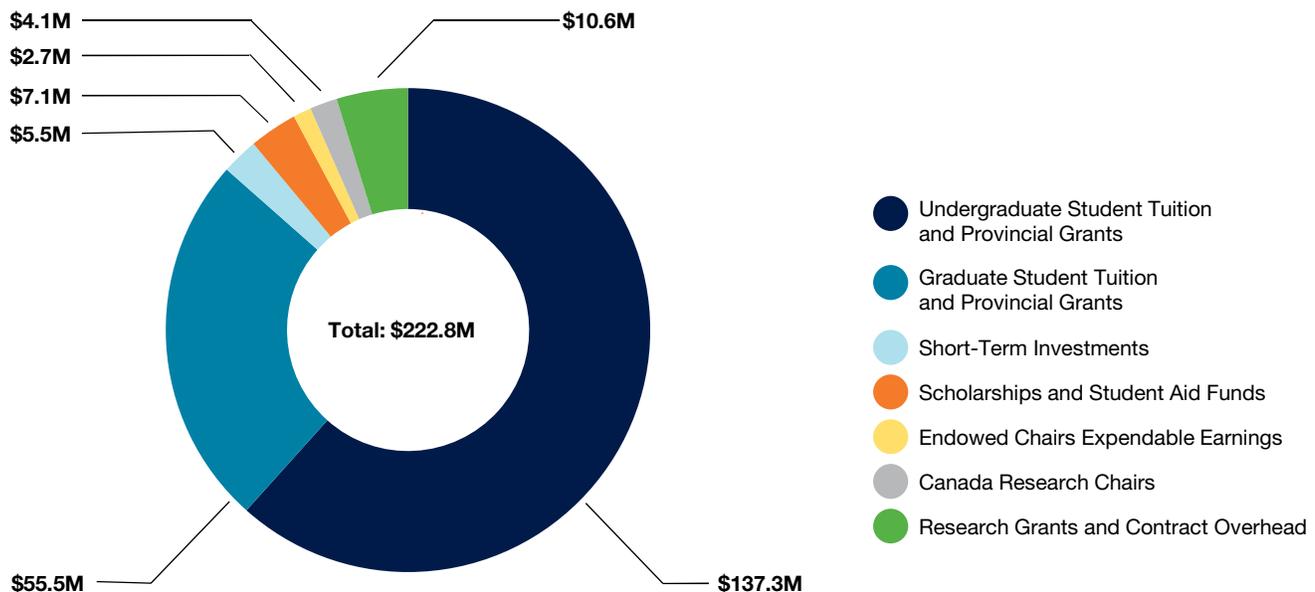


Figure 11.5 Revenue Distribution, 2016–2017

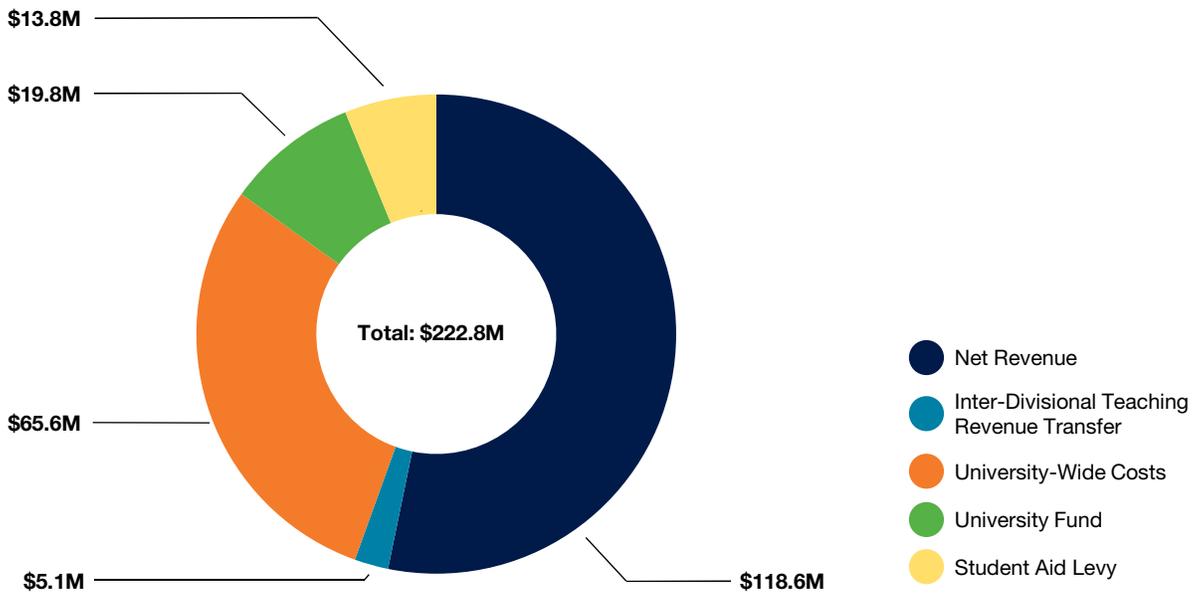
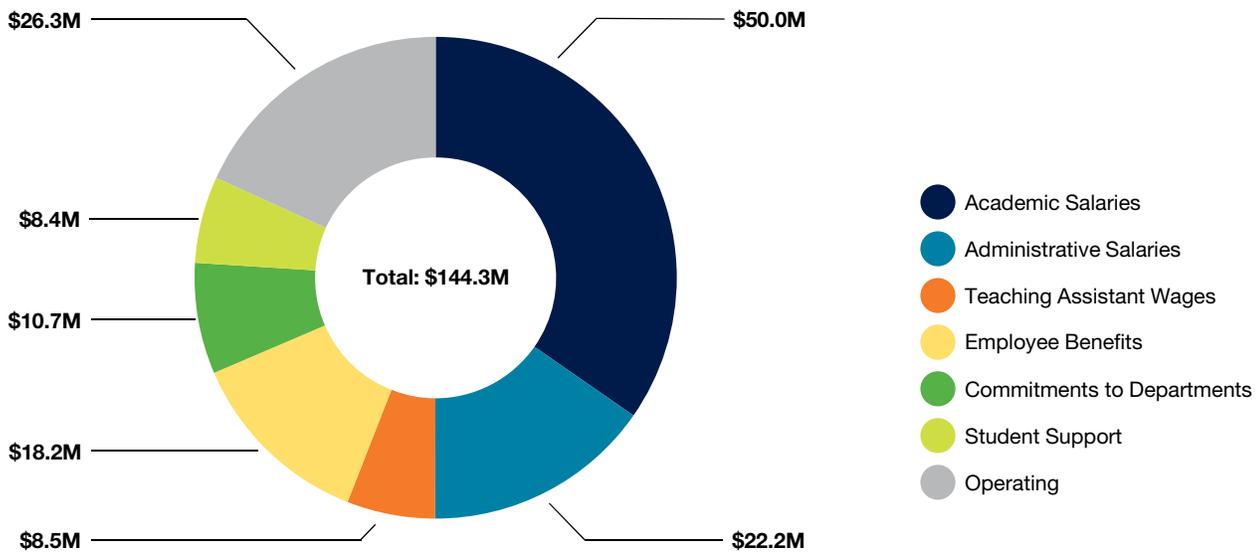


Figure 11.6 Total Operating Budget: Breakdown by Expense, 2016–2017 (net of central university costs)



## Lab Innovation for Toronto (LIFT)

In 2016, the Government of Canada launched the Post-Secondary Institutions Strategic Investment Fund (SIF), a program that will provide up to \$2 billion over three years (2016–2019) to accelerate infrastructure projects at universities and colleges across Canada. Our Faculty was a lead contributor to the University of Toronto's Lab Innovation for Toronto (LIFT) project, which sought support from this fund and from the Province of Ontario for improvements to research infrastructure.

In July 2016, we partnered with the federal and provincial governments to invest a total of \$32.6 million in renovations to 89 laboratory facilities across our Faculty over two years (2016–2018) through LIFT. Some of the improvements include:

- Renovations to lab space in the Galbraith, Sandford Fleming and the Engineering Annex buildings to further

enhance collaboration among researchers within and across disciplines. These renovations will also upgrade environmental controls to protect sensitive research equipment and experimental processes;

- Purchase of new laboratory equipment, including more fumehoods to increase the number of experiments that can be run simultaneously, for labs at the Institute of Biomaterials & Biomedical Engineering (IBBME), the Department of Chemical Engineering & Applied Chemistry and the Department of Mechanical & Industrial Engineering;
- Expansion of the Sustainable Aviation Design Lab at the University of Toronto Institute for Aerospace Studies, enhancing the work of researchers who are reducing emissions and cutting fuel costs in the global aviation industry.

See page 126 for more projects underway.

## Dean's Infrastructure Improvement Fund (DIIF)

We created the Dean's Infrastructure Improvement Fund (DIIF) in 2016 to fund large-scale infrastructure improvements within our Faculty. These projects are brought forward by the sponsoring departments or institutes, who share the costs 50:50 with the Faculty. The purpose of the DIIF is to upgrade facilities and enhance teaching and research laboratory spaces in order to improve the student experience. Projects funded under the DIIF include:

- **Aiming for a Higher CALIBRE Experience** — An extension to the recent renovations of the IBBME teaching laboratory in the Lassonde Mining Building, this project involves upgrading a number of systems, including electrical work, CO<sub>2</sub> gas lines and eyewash stations;

- **Undergraduate Materials Science Labs** — These labs in the Wallberg Building are widely used in first-, second- and third-year courses. They will receive a complete renovation, including new fumehoods, lab benches and moveable furniture;
- **The Catapult Innovation Research Space** — This project will create a joint facility for IBBME and the Department of Medical Imaging. It will upgrade a laboratory facility on the fourth floor of the Rosebrugh Building to Level 2 biosafety standards, which includes a new fumehood, new lab benches and electrical upgrades;
- **Lecture Theatres** — Air-conditioning systems will be added to three lecture theatres in the Mechanical Engineering Building to improve student comfort during lectures.

## Dean's Strategic Fund

The Dean's Strategic Fund (DSF) provides seed funding for projects and initiatives that will have a broad impact within the Faculty. The DSF awarded \$5.3 million over three years to support 20 new projects designed to further the goals of the Faculty's Academic Plan over the next three years. These projects included:

### Lassonde Institute of Mining Hub

This initiative will create a hub for academic-industry partnerships that brings together the Faculty's deep expertise in mineral exploration, mining engineering, computational geomechanics, mineral process engineering, metallurgy and water management to develop transformative solutions to pressing challenges faced by the mining and mineral industry. It will establish an administrative structure for the LMH that includes the creation of an Industry Co-Director to strategically accelerate industry engagement, foster industry-relevant collaborative research and deepen industry connections to the Faculty.

### CGEN Global Partners Initiative

The Centre for Global Engineering (CGEN) is creating a Global Partners Initiative to establish strong partnerships with NGOs, universities, aid agencies and other development organizations for a new global engineering capstone course that will be introduced in 2018. CGEN has identified energy poverty as the next key challenge to be addressed through this course. Students will travel abroad to gather contextual and stakeholder data so they can define problems accurately, and to evaluate and implement technological solutions that they develop. Our partners will facilitate these activities and provide avenues for field translation of our research results. To enable the development of such partnerships, the DSF will support a one-year exploratory initiative to conduct online and field surveys to identify and recruit strong partners to start the capstone course and to identify specific challenges in the area of energy poverty to enable a new research thread within the CGEN community.

### iCity Centre for Automated and Transformative Transportation Systems

The University of Toronto Transportation Research Institute has received DSF support for the creation of the iCity Centre for Automated and Transformative Transportation Systems (iCity-CATTS), which will bring together transportation and technology researchers from across U of T, industry and government to address the transportation system implications of automated vehicle (AV) technologies. Technological advances in this area are proceeding at a rapid pace but many critical questions pertinent to the future of

AVs remain unanswered. Most pressing, and least addressed, are the transportation system challenges and implications for both transportation demand and system performance. A multidisciplinary team drawn from across the Faculty will create analysis tools, methods and decision support systems to quantify the impacts of AV technologies on transportation demand, land use and system performance, which will guide the design, adoption and governance of transportation systems in the new era of driving automation.

Following is a complete list of DSF-funded projects:

- A bio-manufacturing facility for training, research and technology demonstration (BioZone)
- Stimulating enhanced collaboration across ChemE and ECE (ChemE / ECE)
- Raising OCCAM – The Next Step (ChemE / MSE / OCCAM)
- Process Intensification Laboratory – moving towards greener and more sustainable process engineering practises through a scaled-down Approach (ChemE)
- Lassonde Institute of Mining Hub (LMH): Leadership in Mining Innovation (CivE)
- TNFC – UofT's open-access nano-fabrication facility (ECE)
- Graduate student space revival (ECE)
- The Professional Experience Year: program development to increase impact (iLead / Engineering Career Centre)
- Establishing a pathway to sustainability of the Institute for Robotics & Mechatronics (IRM)
- Education & training program: Computer Numerical Controlled Manufacturing (MIE)
- Collaborative Specialization in Psychology and Engineering (MIE)
- Design Catapult (MIE / IMDI)
- Where the Rubber Meets the Road: Seed Funding for Collaborative Self-Driving Car Research Between FASE (Robotics) and the Department of Computer Science (Artificial Intelligence) (UTIAS)
- iCity Centre for Automated and Transformative Transportation Systems (UTTRI)
- Academic advising "portal" (2015) (VDU RO)
- Transformation of library space to enhance innovative learning activities (VDU / Engineering and Computer Science Library)
- SAE AutoDrive Challenge (UTIAS)
- The CGEN Global Partners Initiative (CGEN)
- The metabolomics of environmental and human microbiomes (BioZone)
- Industry Liaison Initiative (IBBME)

## Infrastructure and Facilities

Figure 11.7 Summary of Buildings and Area Occupied by the Faculty of Applied Science & Engineering, 2016–2017

Code	Building	Office of the Dean	EngSci	UTIAS	ChemE	CivE & MinE	ECE	IBBME	MIE	MSE	Total NASMs
AS	Aerospace (Downsview)			5,293							5,293
BA	Bahen Centre	1,112	561		67		5,744		1,375		8,859
DC	CCBR				667			889			1,556
EA	Eng Annex	328					946				1,274
EL	Electrometal									149	149
FI	Fields Institute	325									325
GB	Galbraith	1,667				4,886	4,146				10,699
HA	Haultain				198	110			639	721	1,668
	MaRS West Tower						136	791	183		1,110
MB	Mining					1,205		1,362	1,885	831	5,283
MC	Mech Eng	63							5,397		5,460
PT	D.L. Pratt						1,330			1,488	2,818
RS	Rosebrugh							814	2,096		2,910
SF	Sandford Fleming	766		692		1,559	3,552				6,569
WB	Wallberg	375			8,138		130			1,327	9,970
RM	256 McCaul	528									528
	<b>Total Area</b>	<b>5,164</b>	<b>561</b>	<b>5,985</b>	<b>9,070</b>	<b>7,760</b>	<b>15,984</b>	<b>3,856</b>	<b>11,575</b>	<b>4,516</b>	<b>64,471</b>
<b>64,471 NASMs (Net Assignable Square Metre)</b>											

## Projects Completed – By Building

### D.L. Pratt Building

#### *Room 162 Lab Renovation*

To accommodate new research equipment and processes, we renovated and upgraded the MSE research lab space.

### Lassonde Mining Building

#### *Student Study Seating*

To improve access to student study space, we built additional hallway seating in April 2017.

#### *Office Renovations*

We renovated the first-floor west wing office area to accommodate additional grad student offices for the Lassonde Mineral Engineering Program.

### Wallberg Building

#### *Video-Conferencing System*

We installed a pilot video-conferencing system in WB 407 and commenced its evaluation for Faculty-wide deployment. This will enhance collaboration with partners external to the University.

### University of Toronto Institute for Aerospace Studies

#### *Room 194 Lecture Room*

We completed a small-scale visualization facility and lecture room for computational modeling to improve research capabilities.

### Galbraith Building

#### *Accessibility*

We installed lift systems at the main entrance (35 St. George St.) and from the main lobby to the first-floor corridor near the Registrar's Office to enhance building accessibility.

## Projects Underway – By Building

### LIFT Projects

Over 30 infrastructure projects valued at \$31.6 million are in progress and will be completed by April 2018. They include:

- **University of Toronto Institute for Aerospace Studies Lab Renovation** – We are renovating the Field Robotics Lab and expanding and renovating the Sustainable Aviation Design Lab.
- **Civil Engineering and Electrical & Computer Engineering Lab Renovations** – To create collaborative facilities that will support more graduate researchers and to bring research lab space up to current standards, we are renovating 49 labs in the Galbraith Building, Sandford Fleming Building and the Engineering Annex.
- **Mechanical Engineering Building Lab Renovations** – We are renovating six labs, including the replacement of six fume hoods, the addition of two new fume hoods, and the installation of HVAC systems.
- **Mechanical & Industrial Engineering Lab Renovations** – To better accommodate research in thermal and fluid sciences, and energy and environmental engineering, we are renovating five research labs in the Lassonde Mining and Haultain Buildings.
- **Institute of Biomaterials & Biomedical Engineering Lab Renovations** – To create a more open and collaborative research space, we are renovating 10 labs in the Rosebrugh Building. This includes replacement of fume hoods, the provision of emergency power and the installation of new mechanical and electrical devices.
- **Chemical Engineering & Applied Chemistry Lab Renovations** – We are renovating 10 labs and upgrading the infrastructure of the Wallberg and Pratt Buildings. This includes new fume hoods and windows, and the replacement and modification of mechanical and electrical services.

### Centre for Engineering Innovation & Entrepreneurship

#### *Construction Progress*

We have made significant progress on our new building since the official groundbreaking in June 2015. The concrete pour “topping off” took place in May 2017. Exterior cladding installation, mechanical and electrical rough-ins on the lower levels and construction of a bridge link between the CEIE and Simcoe Hall are in progress.

## University of Toronto Institute for Aerospace Studies

### *Gas Turbine Combustion Research Lab Renovation*

We have begun construction of this new research lab, created in tandem with the associated combustion wind tunnel. We expect to complete the project in late 2017.

## Galbraith Building

### *Room 412 Lab Renovation*

We have begun the conversion of a tutorial room into a wet lab for water-related research in CivE. The project is expected to be complete by July 2017.

## Gull Lake

### *Bunkhouse Project*

Conceptual design of a new bunkhouse to accommodate 68 students has been completed and the compiling of pre-design space-use documentation is in progress.

## Lassonde Mining Building

### *IBBME Undergraduate Teaching Lab Expansion*

We have begun the pre-design phase for a project that will convert room 322 in the Lassonde Mining Building from a research lab to an undergraduate teaching lab.

## Space Audits

We conduct regular audits to inform our infrastructure needs and the most efficient use of space. Over the past year, we made progress on the following audits and reports:

- A space audit of undergraduate teaching labs (final report expected by 2018)
- A report on the Faculty makerspaces completed
- A project planning report for the rooftop expansion on the Wallberg Building to create sustainability labs is in progress (final report expected by fall 2017)
- A safety audit of all common and study rooms completed
- Room data sheets for the Gull Lake Bunkhouse Project are being prepared

## Engineering Annex

### *Havelaar EV Lab EA 109*

We are in the design stage for renovations to this lab to support electric vehicle research.

## Mechanical Engineering Building

### *Lobby Renovations*

This renovation will expand the lobby area of the Mechanical Engineering Building. Construction is scheduled to begin in summer 2018.

### *MC Lecture Theatres – AC*

To improve the student experience, we will install air conditioning in three lecture theatres (in partnership with F&S and ACE) in summer 2018.

### *MC 3rd-Floor Office Renovations*

To enhance faculty space, renovations to create additional faculty offices are scheduled for 2018.

## Wallberg Building

### *Undergraduate Teaching Labs*

We have scheduled upgrades to the undergraduate teaching labs for the summer of 2018.

### *Unit Operations Lab*

We will install a new HVAC system in 2018.