



Wednesday, June 18, 2014
WORKSHOP

7:30 am - 9:30 am
Registration

International Foyer

8:00 am - 8:30 am
Breakfast in the Tradeshow Area
Sponsored by Architecture 49

International Foyer

ARCHITECTURE | 49

8:30 am – 8:45 am
Welcoming Remarks

International AB

- James Dykes, *President, Sustainable Labs Canada*

8:45 am – 9:15 am

International AB

INTEGRATED DESIGN AND OPERATIONS ARE ESSENTIAL TO SUSTAINABLE LABORATORIES

- Ian McDermott, *University Health Network*

A look into how design and operations must be considered as a holistic approach if sustainability is to be achieved. UHN created the Toronto Medical Discovery Tower (TMDT) which opened several years ago as a state-of-the-art medical research centre. Taking the lessons learned from TMDT, UHN created the Krembil Discovery Tower (KDT), which opened in the fall of 2013. What is sustainable design for these medical research labs? What are the sustainable operations that have been put in place? See how TMDT and KDT are moving towards long-term sustainability without compromising any research activities.

9:15 am – 9:45 am

International AB

ENERGY CONSERVATION SCHEMES AND THE IMPORTANCE OF USER ENGAGEMENT

- Roland Triance, *Waldner Limited – UK*

Energy conservation and optimization is one of the most complex issues in facility design, construction and maintenance. There is plenty of experience, know-how and hardware in the market to create holistic, highly efficient and energy saving infrastructure. For very good reasons, it is the demand side that increasingly receives attention by the industry community (the most sophisticated system and hardware will not yield the optimum results if demand side management (DMS) is not part of the scheme). This presentation focuses

on the importance of user engagement as an important part of DSM. The presentation discusses the findings of research conducted, as well as practical examples (hard- and software) of making users part of the scheme. In general, involving and enabling users to increase energy efficiency rather than applying automated control will lead to better results in energy conservation. Do you agree?

9:45 am – 10:15 am

International Foyer

Refreshment Break in the Tradeshow Area

Sponsored by Aqua Air Systems Ltd.



10:15 am - 11:15 am

Concurrent Sessions:

EXPERIENCES FROM THE RELOCATION AND RELOCATION PLANNING OF VARIOUS LABORATORIES

New York

- Peter Slinn, *Natural Resources Canada*

Planning, requirements collection, building construction and scientific equipment procurement specification development, installation and commissioning of scientific equipment, integrating the new or modified facility and associated new or modified scientific equipment with operations requires a diversified and experienced project team possessing strong team building and communication skills.

In today's environment where labs need to be shared and lab construction, operation, and upgrade costs need to be minimized the project team needs to have a broader understanding of the lab's potential future usage and industry best practices.

This presentation discusses the experiences obtained from three lab relocation projects and what the project teams did to address the various technical issues that they faced. The relocation projects were:

- CanmetMATERIALS relocation from 568 Booth Street in Ottawa to 183 Longwood Road South in Hamilton, Ontario;
- Geological Survey of Canada's proposed lab relocation project; and,
- NRCan's Booth Street proposed Relocation Project.

UNIVERSITY ENERGY MANAGEMENT: INTELLIGENT FINANCING

Paris

- Len Sereida, *University of Alberta*

Successful energy management programs have many benefits including utilities cost reduction, infrastructure renewal, reduction in the consumption of non-renewable resources, implementation of renewable energy, reduction in carbon footprint, and support of sustainability goals. In spite of these many benefits funding for energy management programs can often be a challenge. This presentation is a case study of the University of Alberta's very successful and long-standing Envision energy management program which has spanned some 40 years. It will highlight the benefits that have been realized and outline the new seven-year program currently underway, which includes energy efficiency improvements in laboratories. UAlberta's program approach, method of financing with payback from the energy savings, and use of excess savings to fund sustainability programs will also be presented.

11:15 am - 12:15 pm

Concurrent Sessions:

LAB INFRASTRUCTURE RETROFIT AND RENOVATION: THE JC WILT INFECTIOUS DISEASES RESEARCH CENTRE

New York

- Kevin Humeniuk, *Architecture 49*

The recently completed JC Wilt Infectious Diseases Research Centre was designed by an integrated team of architects and engineers at Smith Carter, delivered under contract with Public Works and Government Services Canada. The end client for the project is the National Microbiology Laboratory (NML) and their parent agency, the Public Health Agency of Canada (PHAC).

Located on Logan Avenue in close proximity to the NML, the project comprised the complete renovation and retrofit of a former chemical and material testing laboratory which was originally owned and operated by the provincial government. Effectively complete, the project has now secured a LEED Gold certification by the Canadian Green Building Council. The largest PHAC program within the JC Wilt Lab is the National HIV Retrovirology Laboratory (NHRL), which has been relocated from Ottawa. The new laboratory space also allows PHAC to engage in new initiatives such as a vaccine research and development unit which targets vaccines for pandemic influenza, HIV, and emerging infectious diseases. In addition, specific key programs from the NML have been relocated to the JC Wilt Lab in order to alleviate space constraints.

This presentation will provide a broad overview of the design and construction process. It will touch on the goals and aspirations for the project, and will track how they evolved and influenced key design features. In addition, the presentation will include a description of the sustainability features incorporated into the project.

MULTI-FUNCTIONAL, HIGH-PERFORMANCE RUN AROUND ENERGY RECOVERY SYSTEMS IN COLD CLIMATE ZONES

Paris

- Rudolf Zaengerle, *Konvekta AG*

HVAC systems are among the greatest energy consumers of large buildings – in particular lab buildings with 100% outside air. European high-performance “run around energy recovery systems” (RAERS) with advanced control software are operating at efficiencies of net 70 – 90% (based on annual energy consumption for heating and cooling), taking into account the additional electricity need for glycol pumps and added fan power to compensate for air pressure drop in the coils.

While the thermodynamics of an energy recovery system are relatively simple, it is critical that high-performance systems operate at optimum performance under varying operating parameters. With several variable input parameters (outside air/supply air/return air temperatures; air volumes; glycol volumes and temperatures), controlling and optimizing a system requires a numerical simulation based controller that allows variable amounts of heat transfer fluid to be circulated throughout the system.

In multi-functional systems, additional heat and/or cold is introduced in the glycol circuit, either to boost the heating/cooling capability of the energy recovery system from waste

heat/cold sources, or to control the supply air temperature to the building to eliminate the need of separate heating/cooling coils in the supply air handlers. These features add yet another level of complexity to the controller function.

12:15 pm - 12:30 pm

International AB

Lunch

12:30 pm – 1:30 pm

International AB

Lunchtime Supplier Presentations

1:30 pm - 2:30 pm

Concurrent Sessions:

THE MAINTAINABILITY OF CONTAINMENT FACILITIES

New York

- Tim Lee

Maintainability is crucial for the design, safety and operation of high containment facilities. This presentation will identify some real-life maintainability issues and suggested solutions of the existing facilities. The material presented should prove to be useful for new facilities.

A HOLISTIC OVERVIEW OF TECHNOLOGIES AND STRATEGIES TO ACHIEVE DEEP ENERGY REDUCTIONS IN LABORATORIES

Paris

- Gordon Sharp, *Aircuity, Inc.*

As we strive to build more energy efficient laboratories and vivariums, the most impactful approach is often to reduce the outside airflow. In the last few years new design approaches such as demand based control of lab air change rates, chilled beams (hydronic cooling), and VAV exhaust fan control have been successfully employed to safely reduce these lab airflows to as low as 2 ACH to cut energy consumption significantly. Although these concepts may be discussed individually in the past, this talk provides a holistic discussion of how these and other energy saving technologies such as heat recovery can be combined to create a whole that is greater than the sum of the parts. Several case studies will be provided as well as the results of a sophisticated lab energy analysis tool to determine potential energy and capital cost savings for a typical lab building.

2:30 pm - 3:30 pm

Concurrent Sessions:

SAFETY INTEGRATION IN LAB PLANNING AND SUSTAINABILITY

New York

- John Shannon, *University Health Network*

Creating sustainable laboratory environments that maintain health, safety and security are fundamental to enabling successful research programs. Planning decisions involving design, construction/renovation, maintenance, and operations must take into consideration health, safety and security of persons and the environment. Key considerations include ensuring compliance with current and future regulation, standards and guidelines. Understanding research procedures, hazardous material and laboratory equipment use is important to ensure correct decisions are made for facility design, mechanical systems, engineering controls and material choice.

The presentation will review the following topics in relation to sustainability considerations:

- Fundamentals of health, safety and security;
- Key regulations, standards and guidelines applicable to laboratory environments;
- Hazardous materials and equipment in a laboratory environment;
- Facility design, mechanical systems and engineering controls;
- Health safety and security programs; and,
- Day-to-day operations and continuity of operations due to emergency incident.

SUSTAINABILITY AND ENERGY EFFICIENCY MEASURES FOR THE UNIVERSITY OF TORONTO SCARBOROUGH'S NEW ENVIRONMENTAL SCIENCE AND CHEMISTRY BUILDING

Paris

- Elaine Hopkins, *Smith + Andersen*
- Samuel Mason, *Footprint*

The University of Toronto Scarborough Environmental Science and Chemistry building will be a 110,000 square foot research and academic facility located near Ellesmere Road, Scarborough.

The project was designed by Diamond Schmitt Architects and is being delivered through a design-build procurement method with the construction partner EllisDon. Smith + Andersen (S+A) are the mechanical and electrical engineers. S+A Footprint has worked with EllisDon's sustainable team to provide energy modelling. The project has been designed to submit for LEED Gold certification. The research and teaching portion of the building will offer 150 fume hoods.

Sustainable features include geothermal hybrid heat/cooling, an Earth Tube system to precondition outdoor air, magnetic bearing chillers, lab air heat recovery, an AirCuity Optinet system to monitor air quality and adjust air change rate, unique fritted glazing to minimize solar heat gain, and all LED lighting fixtures. The project is scheduled for completion in July 2015.

3:30 pm – 4:00 pm

International Foyer

Refreshment Break in the Tradeshow Area

Sponsored by DIALOG Architects, Engineers, Interior Designers, Urban Planners, Landscape Architects, and Sustainability Consultants.

DIALOG

4:00 pm - 5:00 pm

Concurrent Sessions:

A REVIEW OF CURRENT STANDARDS AND GUIDELINES REGARDING LAB AIR CHANGE RATES

New York

- Gordon Sharp, *Aircuity, Inc.*

Guidelines and standards regarding the minimum air change rates in laboratories and vivariums have been in a state of flux over the last few years. About ten years ago minimum air change rates were commonly seen prescriptively set at 8 to 12 air changes per hour

(ACH). However, with increasing concerns over rising energy cost the pendulum on air change rates swung to lower prescriptive rates in the range of 6 to 10 ACH. More recently the pendulum on air change rates has swung back, more to the middle with an increasing emphasis on performance based setting of a wider range of air change rates set manually on a periodic basis or near continuously via automatic controls.

This presentation will review the current status of many different air change rate guidelines, standards and best practices on ventilation and how they changed in the last few years. Examples of recently changed standards that will be reviewed include the 2011 version of NFPA 45 Standard on Fire Protection for Laboratories Using Chemicals, the 2012 version of ANSI/AIHA Z9.5 Standard on Laboratory Ventilation, the 2010 ASHRAE 62.1 Standard on Ventilation for Acceptable Indoor Air Quality, Chapter 16 of the 2011 Edition of the ASHRAE Handbook on Laboratories and several other US and International Standards that relate to laboratories.

Finally, the presentation will also review some of the recent changes in ventilation standards relating to vivariums. Some of the standards that will be discussed include again Chapter 16 of the 2011 Edition of the ASHRAE Handbook on Laboratories, as well as the 2010 version of the ILAR (Institute for Laboratory Animal Research) Guide on for the Care and Use of Laboratory Animals as well as AAALAC's (Association for Assessment and Accreditation of Laboratory Animal Care) views on vivarium ventilation levels.

LABORATORIES IN A CHANGING WORLD

Paris

- Vernon Solomon, *Environmental Systems Corporation & Concepts to Solutions Inc.*

This presentation will focus on the changes in the world and laboratories over the past forty years, and how our changing world vision will affect how we design and upgrade laboratories going forward.

How can we adapt advances in technology to change our laboratories today and in the future, and how we can implement these changes in the real world to meet the "new normal"?

5:00 pm – 7:00 pm

International AB

Networking Reception in the Tradeshow Area





Thursday, June 19, 2014
WORKSHOP

7:30 am – 9:30 am
Registration

International Foyer

7:30 am – 8:30 am
Breakfast in the Tradeshow Area
Sponsored by Hemisphere Engineering

International Foyer



8:30 am – 8:45 am
WELCOMING REMARKS

International AB

- James Dykes, *President, Sustainable Labs Canada*

8:45 am – 9:15 am

International AB

**THE CHALLENGES OF CONDUCTING INNOVATIVE RESEARCH IN AGING
INFRASTRUCTURE – THE NEED FOR SUSTAINABILITY**

- Mike Dymarski, *University of Toronto*

Conducting innovative research is the goal of all research universities. Each year, there is keen competition to attract government and private funding to support this research effort. In most cases the funding is for the research itself and does not adequately address the infrastructure needs to facilitate this research.

At the same time, the infrastructure in Canadian research universities is aging. The need to rejuvenate research laboratory space as either renovation or new build presents an opportunity to provide sustainable facilities that go beyond the funding investment.

A review of the complexities that affect the decision-making process in universities is presented. Case studies of several successful infrastructure projects in Canadian universities are also presented.

9:15 am – 9:45 am

International AB

A WALK WITH OWNERS

- Phil Wirdzek, *International Institute for Sustainable Laboratories*

At every hand-off point in the chain of events leading to a lab's delivery and to each and every "stakeholder" in a facility, a Building Information Model (BIM) should enable the transfer of all information to each so all stakeholders understand the purpose, function and performance of the lab that has been purchased so each can take responsibility in contributing toward the facility's expected performance goals. There is no other facility with the urgency for this capability than in labs where safety, health, environmental impacts, resource efficiency, and financial investment (including materials, equipment, and most importantly people) must work together, hand-in-glove.

9:45 am – 10:15 am

International Foyer

Refreshment Break in the Tradeshow Area

Sponsored by DIALOG Architects, Engineers, Interior Designers, Urban Planners, Landscape Architects, and Sustainability Consultants.

DIALOG

10:15 am - 11:15 am

Concurrent Sessions:

THE FUTURE OF CHANGE: LASER SCANNING AND BUILDING INFORMATION MODELING FOR THE RENOVATION OF LABS (FROM A MECHANICAL PERSPECTIVE)

New York

- Trevor M. Uitvlugt, *Hemisphere Engineering Inc.*

Renovating and upgrading a sophisticated laboratory facility is not an easy task. The journey through a modernization project can be full of struggle, frustration and risk. Many facilities do not have accurate records of their original installations, or of their previous renovations. This leads to questions and confusion about what the existing conditions actually are. Even if "as-built" or "record" drawings are available, how accurate are they?

While the rise of 3D design software and engineering techniques has led to a better ability of designers to map out complicated congested spaces, we are still limited by the information available. This is especially true for renovations. Missing or inaccurate starting information can lead to a "garbage in means garbage out" design which ultimately leads to time and cost overruns during construction.

The next stage in the evolution of design technology is to add 3D laser scanning and point cloud mapping. By starting out with an accurate 3D image of the existing facility, a better understanding of design limitations and roadblocks can be developed earlier in the design phase. A more accurate scope of work can be developed which takes into account actual site conditions, and thus reduces the surprises encountered during construction.

COLABORATIVE PROJECT DELIVERY

Paris

- Scott Matheson, *PCL Construction Management Inc.*

The session on CoLABorative Project Delivery will add value to all participants involved in the procurement and delivery of laboratory projects across Canada. The core of

this presentation will discuss project risk and covers important lessons learned by the construction community delivering the projects through various project delivery models. This session goes a step further to make a bold recommendation on how to procure the right construction services necessary to deliver a successful project.

11:15 am - 12:15 pm

Concurrent Sessions:

BUILDING FOR THE FUTURE

New York

- Christiane Claessens, *Public Health Agency of Canada*

The Public Health Agency of Canada (PHAC) and the Canadian Food Inspection Agency (CFIA) are responsible for regulating facilities handling human pathogens, imported animal pathogens and toxins, and the Canadian Biosafety Standards and Guidelines (CBSG) provides Canadians with the physical and operational biosafety requirements to ensure their safe handling.

The CBSG, 1st Edition was published in June 2013, and since then the Agencies have been working on the second edition, to coincide with the full implementation of the Human Pathogens and Toxins Act (HPTA) and the Human Pathogens and Toxins Regulations (HPTR). Concurrently, the Agency has undertaken capacity-building work to promote compliance.

CONTROLLING VARIABLE VOLUME CRITICAL EXHAUST SYSTEMS TO OPTIMIZE PERFORMANCE AND MINIMIZE ENERGY COSTS

Paris

- Douglas Ross, *M.K. Plastics Corporation*

While there is significant focus placed on conditioned environment HVAC design, this presentation will discuss the nature of variable volume critical exhaust systems, the challenges associated with controlling these systems and design approaches to optimize system operation while minimizing associated energy costs.

The discussion will address the need to understand the turndown range, time distributions associated with that range, fundamental design considerations and optimal fan equipment selection techniques.

Then we will explain control sequence design to properly manage and report the critical parameters, respond to external inputs (i.e., air quality, meteorological conditions, etc.), while operating continuously, safely and with minimal energy consumption.

12:15 pm – 12:30 pm

International AB

Lunch

12:30 pm – 1:30 pm

International AB

Lunchtime Supplier Presentations

1:30 pm - 2:30 pm

Concurrent Sessions:

VIDO/INTERVAC – EFFICIENCY AND SAFETY THROUGH NEXT GENERATION CONTAINMENT TECHNOLOGIES

New York

- Cam Ewart, *University of Saskatchewan*
- Phil Chearmonte, *Camfill*

Part 1

The rate of adoption of new technologies is fairly well understood – early adopters lead the curve, blazing the trail for others to follow after. High containment is no exception, though the stakes could be considered higher, due to the nature of the research being done within. The Intervac facility boasts not only a highly functional mechanical and architectural design, it also houses the most advanced containment solutions in North America! This discussion will center around said technology, what new functionalities are available and how they can be utilized both for advanced safety and security, as well as operational efficiencies.

Part 2

Driving a project from cradle to grave is no easy task; in this section we will review the stages from design to implementation, then the day to day usage of Intervac's containment systems, with a unique view around some of the challenges encountered and best practices learned along the way.

CANMET MATERIALS AND TESTING LABORATORY – AN UPDATE FOLLOWING 2-YEARS OF OPERATION OF ONE OF CANADA'S GREENEST BUILDINGS

Paris

- Mike Williams, *RWDI*

Located on McMaster Innovation Park (MIP) in Hamilton, Ontario, Natural Resources Canada's CANMET Materials and Testing Laboratory is one of Canada's and perhaps the world's greenest buildings. The 16,000 m² facility includes a mix of laboratory, office and collaboration program areas.

The project was completed in 2011 and since that time has achieved a LEED-Platinum level of certification and perhaps more importantly has confirmed through an extensive ongoing measurement and verification program that the building is using 64% less energy when compared to similar operational laboratories.

This presentation will outline some of the key energy conservation measures that have been implemented at CANMET and will share some of lessons learned throughout the design, construction and operations phases of the project.

2:30 pm - 3:30 pm

Concurrent Sessions:

SUSTAINABLE AND LOCALLY PRACTICAL SOLUTIONS FOR LABORATORIES IN RESOURCE LIMITED COUNTRIES

New York

- Maureen Ellis, *International Federation of Biosafety Associations*

The International Federation of Biosafety Associations (IFBA) is a non-profit organization dedicated to strengthening global biosafety and is an advocate for sustainable laboratory capacity. Many countries heavily burdened by infectious diseases lack appropriate laboratories to safely carry out diagnostic activities and struggle to implement laboratory infrastructure solutions which have been designed for use in other parts of the world where different working conditions prevail. Compounding the problem is a lack of well-trained operations and maintenance engineers that can adequately maintain and operate laboratories and critical biosafety equipment. The IFBA's network of biocontainment engineers and architects identifies practical solutions and best practices for these laboratories so that they can be practical, durable, cost-effective and locally maintained. The group is also mentoring those new in the field of laboratory engineering and providing guidance on maintaining sustainable laboratories in their unique regional settings.

The IFBA advocates for risk-based design approaches, not to lay out the specific requirements for a BSL2 or BSL3 laboratory, but rather to describe "how" these facilities should be planned and designed based on a local risk assessment. The trend in containment technology has been to build containment laboratories highly dependent on engineering controls and technology and inevitably construction and maintenance costs for these facilities become prohibitive. The best solutions typically understand and account for cost pressures, the lack of local technical equipment and replacement parts, unreliable utilities, and local inexperience in constructing and operating laboratory facilities. Over the next several years the group is focusing on a variety of projects including the development of a new tool to verify the correct operation of biological safety cabinets which can be easily performed with readily available materials by laboratory technicians with minimal training and minimal need for expensive calibrated equipment. As a member of the Stop TB Partnership's Global Laboratory Initiative, the IFBA and its partners are also exploring innovative solutions for TB laboratories including modular approaches and natural ventilation.

PUTTING ENERGY HOGS ON A DIET: FILTERED FUME HOODS

Paris

- Kenneth Crooks, *Erlab*

There have been laudable and successful attempts to mitigate energy use of fume hoods with "low-flow, high containment" designs (including conversion kits for existing fume hoods), control technology advancements, simple air exhaust arms, and even energy recovery wheels. But these energy hogs remain pretty fat. This session will review how a radical new filter technology puts these hogs on a diet with substantial reductions in both operating and capital budgets.

The speaker will review and analyze results and lessons learned from use of this new filter technology, which in many laboratories eliminates the need to exhaust fume hoods. Existing installations (new and renovated) of this technology (including in Canada) will be reviewed.

Innovative laboratory configurations and HVAC system features are facilitating creation of highly productive science spaces with lower capital and operating costs and improved sustainability – and in unexpected locations. A decision-making matrix for matching research requirements with new efficiency features and technology will be presented. Data will explore the impact on the scientific workspace including increased research program capacity, adaptability and flexibility, reduced HVAC capacity requirements and electrical loads, and streamlined maintenance models. Emphasized will be extensive, built-in safety measures superior to that found in existing laboratories. This is not a sales pitch; it is an opportunity to explore a radically new paradigm for laboratories.

3:30 pm – 4:00 pm

Refreshment Break in the Tradeshow Area

International Foyer

4:00 pm – 4:45 pm

PANEL DISCUSSION: WHAT DO WE NEED TO DO TO IMPROVE IMPLEMENTATION OF SUSTAINABLE LAB DESIGN CONCEPTS AND PRACTICES?

International AB

- Ana Coppinger, *Architecture 49*
- Ian McDermott, *University Health Network*
- Kurt Montero, *Smith + Andersen*
- Erik Olsen, *Transsolar*
- Gordon Sharp, *Aircuity, Inc.*

4:45 pm – 5:00 pm

Closing Remarks

International AB

- James Dykes, *President, Sustainable Labs Canada*



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Interested in learning more about sustainable laboratories?

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