

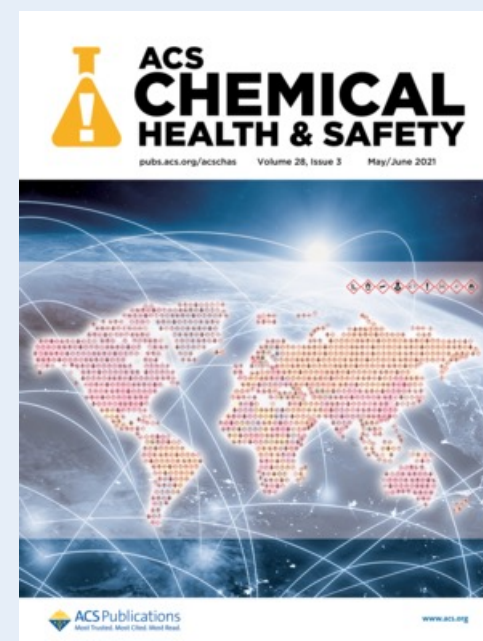
Safety in the lab facility system

Ralph Stuart, CIH, CCHO
Environmental Safety Manager
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August, 2021

Virtual Presentation

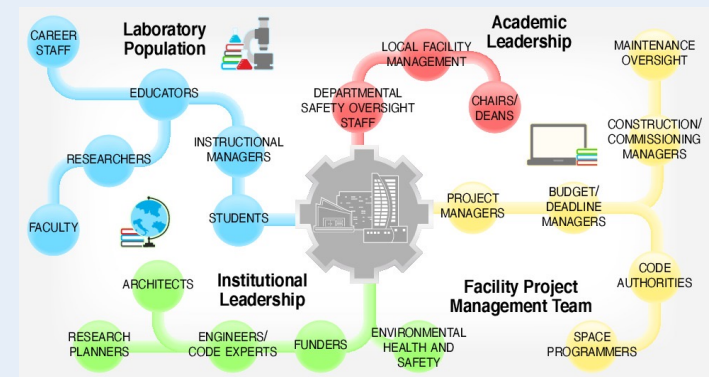
Today's Talk

- This talk is an outgrowth of a special issue of the *ACS Chemical Health and Safety*. I am co-editor of this special issue with *Michael Labosky, Ellen Sweet* and *Melinda Box*.
- This project began in 2019, when I was approached by Mary Beth Mulcahy, the editor of the journal. She wanted to explore the topic of **how lab buildings impact lab safety**, primarily from the point of view of the lab worker.
- I said, *"Well, that's a big question right? No lab worker works alone even if they don't see or know everyone who supports their work in the lab building"*.
- Mary Beth and I talked through some of the challenges I saw in addressing this topic, and she said *"Yeah, those are the issues what I want to share with the laboratory community"*.



Today's Talk

- So, today's talk is based on a **call for papers** that we five wrote to provide context for potential authors to fit their contributions into.
- I'll describe my personal experiences with laboratory and chemically oriented facilities and how those experiences impact our approach to Mary Beth's request.
- Many of the ideas I talk about in this paper are connected to ideas in other papers I am giving at this meeting. The common theme among those papers is that ***safety is a property of an evolving, resilient complex system, not a condition of a space or a person which can be established and then left to run on its own.***
- I would also note that the graphics in the editorial are schematic simplifications of real life. They are **orientation tools** rather than literal representations of all situations. This is the level of detail we work with in managing buildings on a day to day basis.



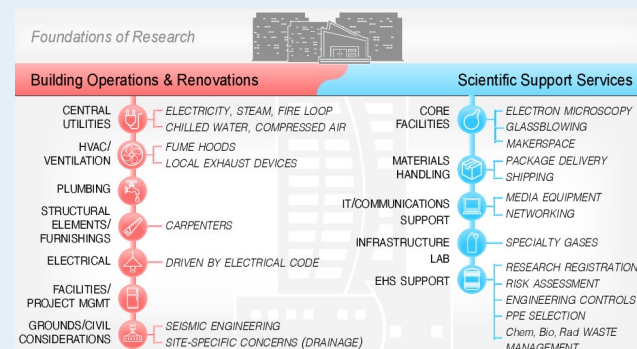
Overview

This paper explores how the lab facility's elements interact with the science they support and **the safety implications** of those interactions.

Key takeaways:

- Laboratory facilities are **complex systems** of *stakeholders, facilities* and *institutional needs*. They are the intersection of management systems with **different perspectives** on the building:
 - Academic management thinks of lab in terms of who works there
 - Facilities staff think of lab spaces as areas with high maintenance and operations costs
 - EHS staff think of lab spaces as part of the safety system of the labs
- **Safety** in a lab building is an intersection of its history and current use

Bottom line:
*It takes a village
to run a lab
building safely!*

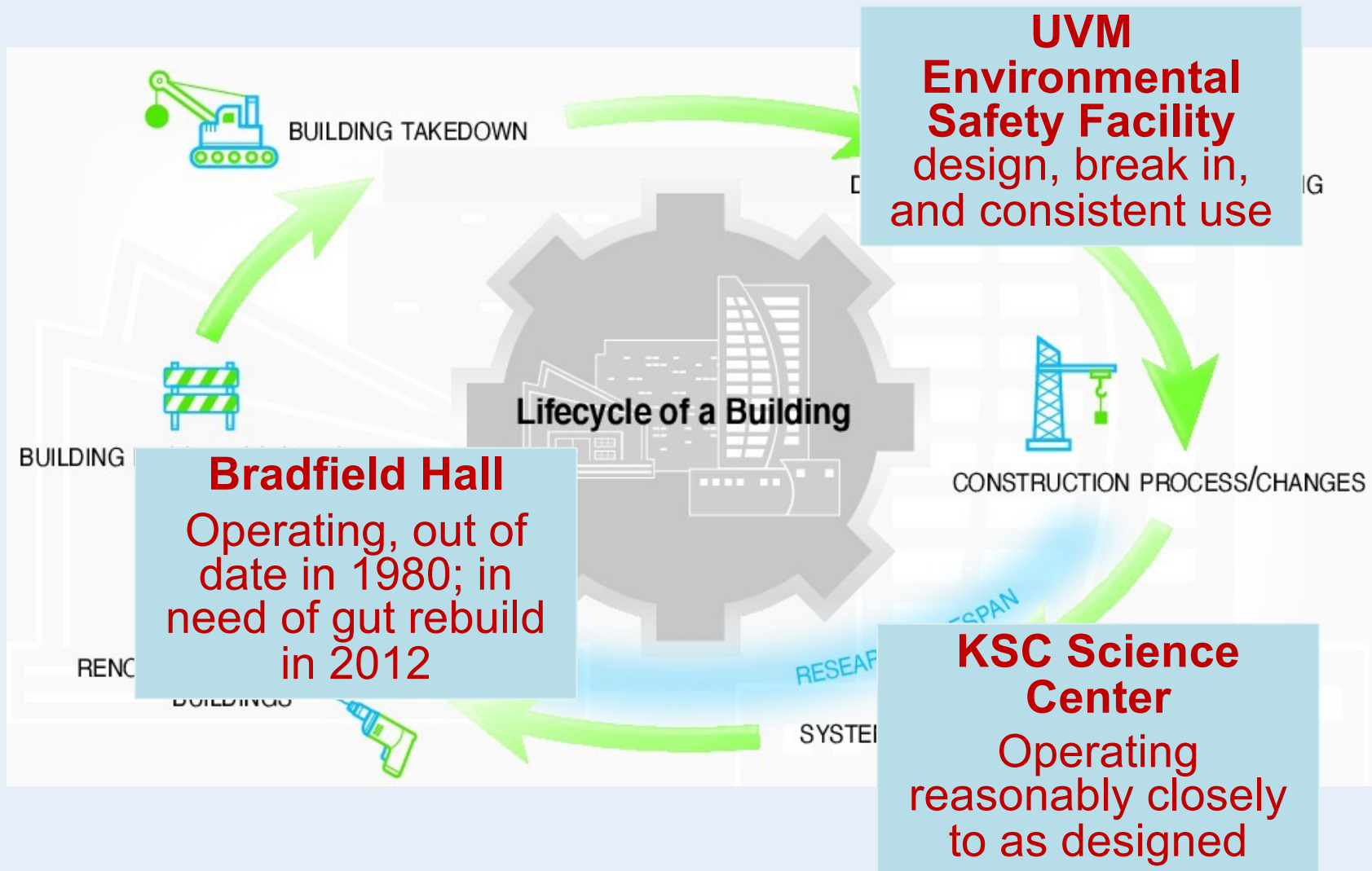


My History in Lab Buildings

- In 1980, I started my lab career with 2 years in Bradfield Hall the agronomy department at **Cornell**
- I was in environmental health and safety at **UVM** for 25 years.
- In 2011, back to **Cornell** for 3 years help optimize lab ventilation
- In 2014, I moved to **Keene State** where we have two lab buildings.



The Life Cycle of a Lab Building



Step 1:

New Construction and Lab Renovations

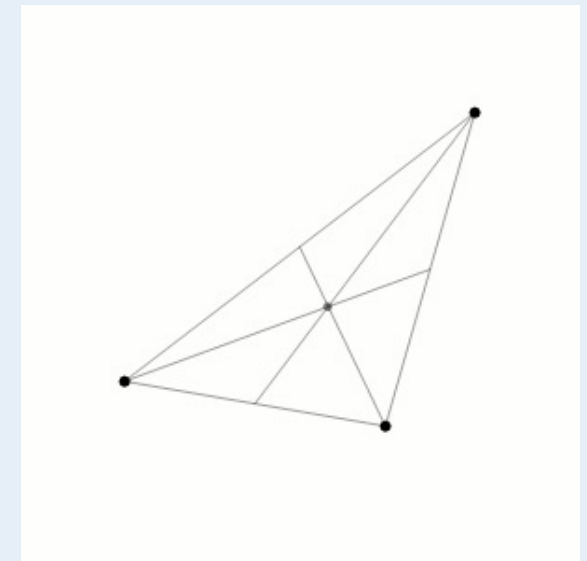
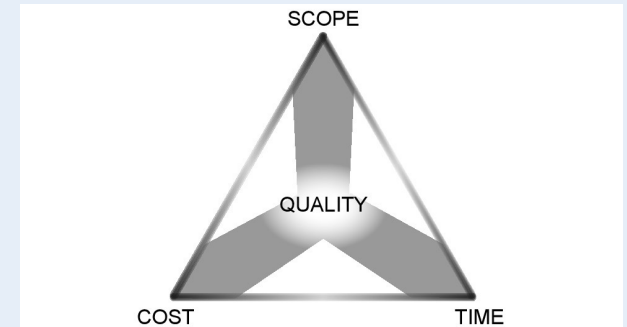
Building a new lab building presents interesting opportunities and challenges, both technical and communication.

The technical challenges are summarized in the **Iron Law of Project Management**:

"Good, fast, cheap. Choose two."

The Iron Triangle creates a **three-body program** which has no mathematical solution.

This means that the quality of the result (i.e. the **fit** of the delivered lab building to the science it hosts) is unpredictable



Part 2:

Operating Safe Lab Buildings

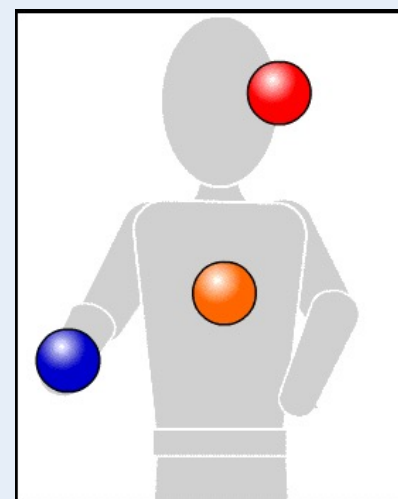
Once a lab building has been put into service there are three competing priorities:

- *Flexibility*
- *Operating costs*
- *Productive and comfortable science*

which again creates a complex system

Complex systems need to be **consciously** managed on an ongoing basis.

A change in one aspect of the system (e.g. temperature control bands in the lab) can unexpectedly impact another aspect (e.g. the rate of reaction of chemistry in a fume hood)



Friction Points in the Stakeholder Universe

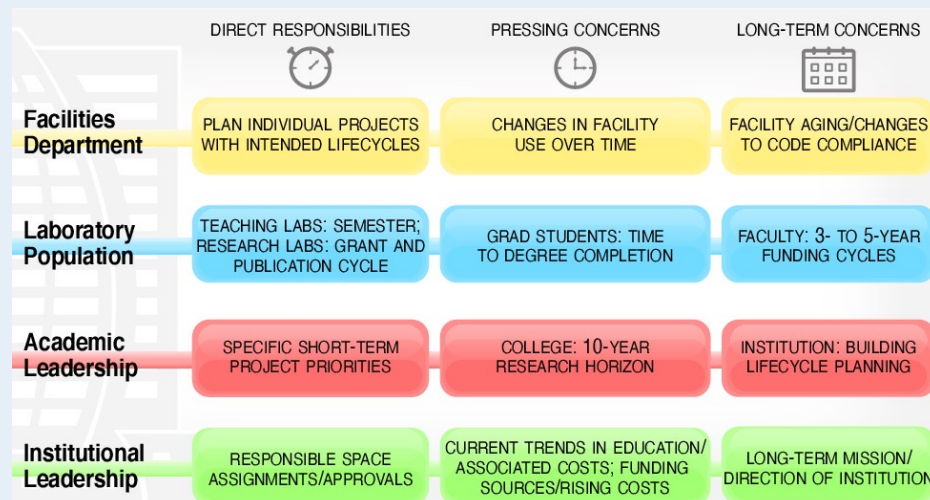
Disciplinary silos

- Chemistry vs hazmat
- Code goals and expectations (prevent prior incidents) vs. support for new processes (budgetary expectations for facility maintenance)
- Varying safety cultures between disciplines and trades

Change of stakeholders over time

Negotiating project ambition

- Varying planning time horizons
- Flexibility vs specificity
- Balancing budget, deadline and scope while maintaining quality



Win-Win Lab Facility Opportunities

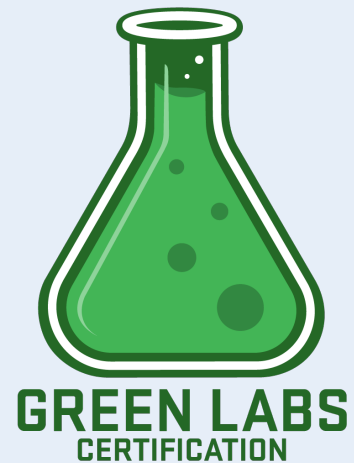
Connecting Facility Safety and Sustainability Education

- Assessing the impact of environmental considerations on safety and vice versa
- Prioritizing various impacts
- Value for money

Organizational Development

Managing facilities is an opportunity to learn about other stakeholders and how to develop teamwork among them


- Making decisions under pressure during design
- Understanding new spaces, for both facility staff and lab occupants
- On-boarding new lab members



Quick Communication about Lab Facilities (Draft video)

LAB
VENTILATION

Longer Communication about Lab Facilities (ACS webinar)

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Working Together to Design Safer Laboratories

ACS Webinars | July 8, 2021

Laboratory science in the 21st Century is becoming increasingly interdisciplinary, which is presenting new challenges in designing and operating lab buildings that house this science. Designing laboratories that allow for safe and efficient research requires input and collaboration between researchers, architects, engineers and lab planners. Once constructed, maintaining safe working conditions in these environments starts with proper commissioning and turnover to facilities staff followed by ongoing communication with the laboratory population.

Join EHS Office Associate Director Michael Labosky of MIT, Laboratory Ventilation Specialist Ellen Sweet of Cornell University, and Organic Lab Supervisor Melinda Box of N.C. State University as they explore the challenges of designing and operating labs from multiple perspectives, using concrete examples from the real world. Discover how to identify and address safety problems related to laboratory facilities as they arise and much more.

This ACS Webinar is moderated by Environmental Safety Manager Ralph Stuart of Keene State College and is co-produced with the ACS Division of Chemical Safety and the ACS Committee on Chemical Safety.



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EXPERTS

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<https://www.acs.org/content/acs/en/acs-webinars/popular-chemistry/design-labs.html>

Tell Us What You Have Learned about Working Safety in Lab Buildings!

Safe Lab Design: A Call for Papers

Ralph Stuart, Ellen Sweet,
Michael Labosky, Melinda
Box, and Mary Beth Mulcahy

ACS Chemical Health Safety
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Current articles

1. Code Considerations for the Design of Laboratories Which Will Also House Pilot Plants
2. Planning and Building Laboratories: A Collaboration among Many
3. Controls for University Fabrication Laboratories—Best Practices for Health and Safety
4. Design and Practice of an Organic Analysis Laboratory to Enhance Laboratory Safety

Acknowledgements

Facility staff at UVM, Cornell and Keene State

- Department and college managers for their questions
- HVAC superintendents and trades people for their patience
- Energy managers for their professional support

Lab architects and design engineers at UVM and Cornell

- For educating me about the work they do

Virtual Issue Focus Group

Lab workers at UVM, Cornell and Keene State

- Those who **work to understand** how to use their spaces safely
- Those who complain *productively*
- Those who complain *persistently*

