

Laboratories - New Technologies, Pedagogies, Space Strategies, and Energy

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Laboratories Renovated in the Past Six Years

- Rieveschl
 - 1969 Year Built
 - 241,902 GSF
- Medical Sciences Building
 - 1974 Year Built
 - 815,364 GSF
- Crawley - Center for Academic Research Excellence
 - 2008 Year Built
 - 250,787 GSF

Rieveschl Building Summary

- Five Stories
- Primary Occupants
 - Chemistry Research, Chemistry teaching Labs
 - Biology Research, Biology teaching labs
 - Faculty Offices
 - General Classrooms

Existing Conditions Rieveschl



Existing Rieveschl

- Approximately 50,000 GSF per Floor
- Original configuration was primarily teaching laboratories
 - 48 student rooms used for 24 students or used as a research laboratory
- Steel frame building with asbestos fire proofing
- High Energy User
- No Fire Protection
- 40 year old infrastructure

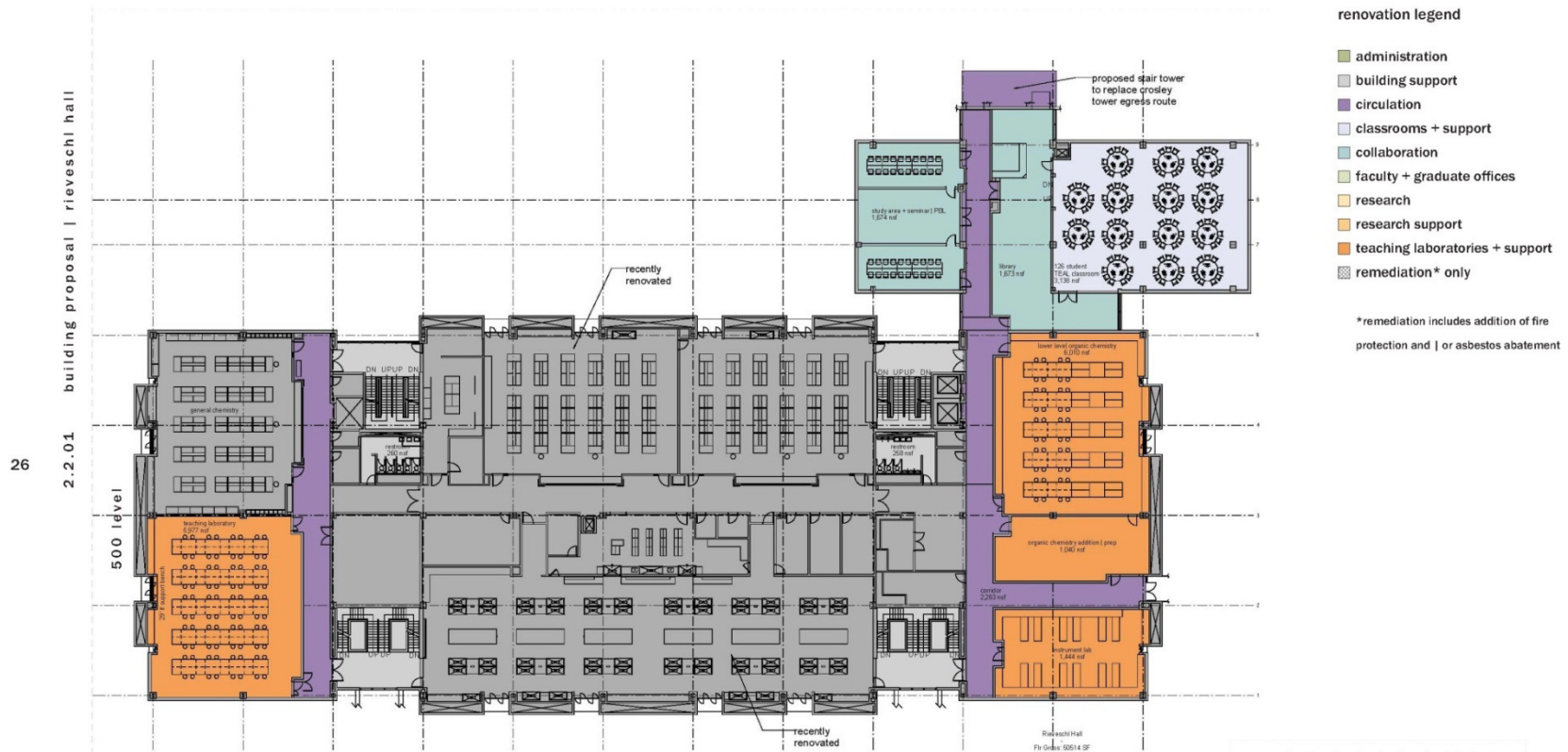
Construction Constraints

- Building is to be renovated over a 7 to 8 years period while occupied. Phased renovation using a consistent systems in each phase. Start on the 500 Level.
- The core HVAC, plumbing and electric systems were maintained throughout construction.
- The existing systems were enhanced more than replaced air systems were used rather than hydronic systems, with no major changes to the building service entrance systems.
- No swing space

Master Plan Objectives

- Chemistry Research on the 400 Level
 - Utilize open labs in place of the individual labs currently used in Crosley Tower
 - 400 Level allows the highest level of hazardous chemicals
- Chemistry Teaching Labs on the 500 Level
 - Double the number of students
- Biology Teaching Labs on the 600 Level
 - Double the number of students
- Chemistry and Biology Research on the 700 and 800
 - Move chemistry syntheses labs from Crosley
 - Utilize open labs
- Energy
 - Reduce energy consumption with systems with 5 to 7 year payback

Chemistry Teaching Laboratories – 500 Level



Organic/Sophomore Chemistry



Freshmen Chemistry



Chemistry Teaching Labs

- The labs are a scheduled resource, they are not used for lectures
- Three freshmen labs 66 students
 - Labs are conducted in three groups simultaneously
- One sophomore/organic chemistry lab
 - 48 fume hoods and can handle 96 students
- Two labs that can handle 63 students
 - Used for freshmen, sophomore and other classes for upper classmen – Chemistry Majors

Biology Classroom Labs – 600 Level



Biology Teaching Labs – 600 Level



Biology Teaching Labs

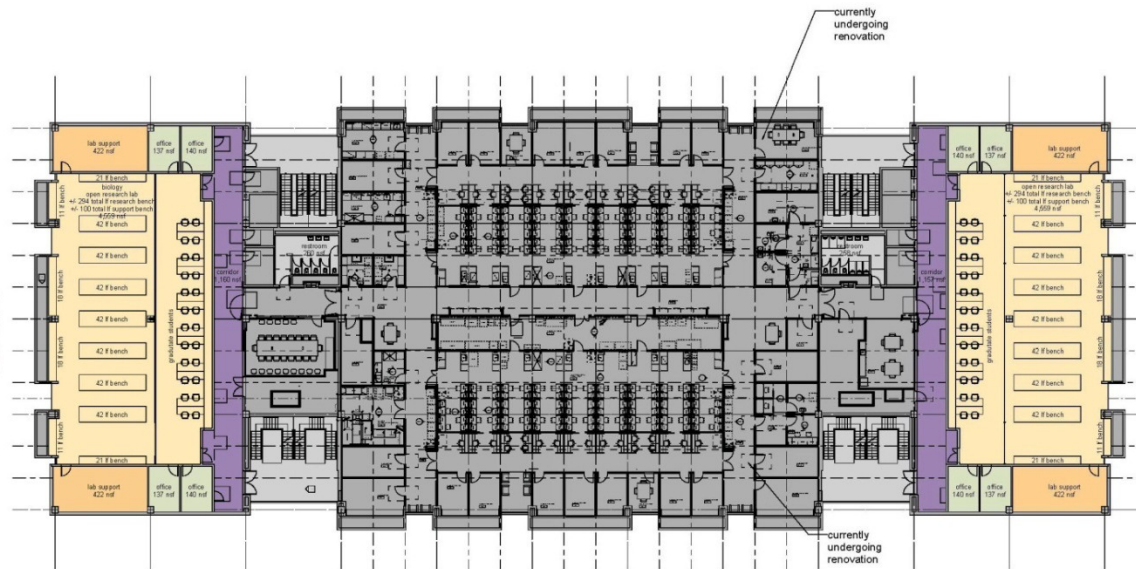
- 12 Biology Teaching Labs
 - They are typically 24 students, six tables of four students
- All the labs are designed for a specific class
 - Freshmen, sophomores, microbiology, physiology, and neurobiology

Typical Floor Plan for the 400, 700 and 800 Levels

30

2.2.01 building proposal | rieveschl hall

700 level



renovation legend

- administration
- building support
- circulation
- classrooms + support
- collaboration
- faculty + graduate offices
- research
- research support
- teaching laboratories + support
- remediation* only

*remediation includes addition of fire protection and | or asbestos abatement

Open Laboratory



Rieveschl HVAC

Original Systems

- 10 - 25,000 CFM AHU's
 - Constant Volume Dual Duct
 - Pneumatic thermostats
 - DDC install in mid 1980's
- 100 fume hood exhaust fans and 10 general exhaust fans
 - No energy recovery
- 100% O.A. heating unit serving a green house

New Systems

- 2 – 120,000 CFM AHU's
 - Variable air volume reheat
 - **Occupancy sensors**
 - 8 ACH occupied, 4 ACH unoccupied
 - Decommission mode shut-off on hoods in teaching labs
- 2 energy recovery units
 - **Energy recovery** on general exhaust, a run around loop
- Greenhouse is served with 5 evap. coolers and 7 unit heaters

Rieveschl Electric

- Original Systems

- T-8 bulbs
 - T-12's were replaced in the 1990's in original 1 x 4 fixtures

- New Systems

- Premium efficiency motors
- No automatic shut-off of receptacles
- Lighting T-8 bulbs
 - Occupancy Sensors for lighting
 - Limited windows prevented daylight harvesting
- Variable speed drives
 - Fans and Pumps
 - System static pressure reset

Rieveschl Water Usage

- Water powered vacuum inductors were replaced with vacuum pumps
- The laboratory air compressor domestic water cooling system was replaced.
- Low flow toilets were installed
- An RO system was added

Rieveschl Use Changes

- 48 fume hoods were added to one room for Organic chemistry
 - Operational about 1000 hours per year
- 20 fume hoods were added for Syntheses chemists moved for Crosley tower
 - Operational 8760 hours per year
- Closed labs were changed to open labs which increased the population density
- All animals with rights were removed. Biology research is with plants or spiders, crickets, flies, hermit crabs, nematodes, frogs, leeches, etc

Energy Definition

- In the presentation energy is defined as follows - Energy Unit Intensity (EUI) BTU/GSF – Yr, it is not weather normalized.
 - EUI Metered: steam(does not consider boiler loses or steam from HRSG), chilled water (does not consider COP of the chiller plant) and electric does not consider utility company loses
 - EUI Site in kBTU: does not consider utility company loses for electric production (typical)
 - EUI Source in kBTU: fuel consumed, also how Energy Star Portfolio Manager (ESPM) calculates

Energy Impact

	Steam	Chilled Water	Electric
	BTU/GSF-YR	BTU/GSF-YR	BTU/GSF-YR
Rieveschl			
FY 06-07	95,000	99,951	79,090
FY 14-15	78,693	133,616	95,597
% Change	-17%	34%	21%
MSB			
FY 06-07	152,156	126,223	84,924
FY 14-15	139,489	102,526	75,604
% Change	-8%	-19%	-11%
CARE			
FY 10-11	132,652	190,612	145,994
FY 14-15	102,450	123,257	114,252
% Change	-23%	-35%	-22%

Total Energy EUI Change

	EUI Site (typical)	EUI Source (ESPM)
	KBTU/GSF-YR	
Rieveschl		
FY 06-07	176	471
FY 14-15	181	464
% Change	3%	-1%
MSB		
FY 06-07	245	692
FY 14-15	219	618
% Change	-11%	-11%
CARE		
FY 10-11	284	735
FY 14-15	212	542
% Change	-25%	-26%

Results - Energy

- The building with the biggest changes had the least energy change.
- Each of the building's energy intensity EUI is relatively consistent energy.
- All the building had a relatively large drop in steam usage.
- HB 251, created an energy reduction goal of 20% from FY04 to FY14. UC achieved this with 15% reduction from the plant and 5% from buildings.

Integration Intricacies Building

- Building side the goal is to use less energy with occupancy sensors used to control air flow and energy recovery systems.
 - Better air flow control and energy recovery coils create high static pressure during peak loads
 - Reducing air flow based on temperature and fume hood usage provided poor result, ACH limits had to be established, UC settled on 4 ACH unoccupied and 8 ACH occupied.
- The data is not weather normalized it would be good to have more data.

Results Building Occupants

- The Building provided better performance for the occupants
 - Greatest is being able to accommodate occupancy changes
 - Allows greater flexibility with the ability to get research
 - There has more Clinical Research
 - Improved the utilization of the space
 - Since FY06-07 UC's enrolment has grown by around 8,000 students, most of the growth is in STEMM programs
 - All STEMM students go through Rieveschl
 - Improve the teaching pedagogy
 - Improve the building safety
- Improve building services
 - Added a contemporary vacuum and pure water systems, and server room
- The work to date has been accomplished in four phases for about \$45M - Rieveschl