University of Wisconsin – La Crosse

SCIENCE LABS BUILDING – PHASE 2

10% CONCEPT REPORT

river ARCHITECTS || SMITHGROUPJJR

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1.1 Introduction/Overview

Continuing the momentum and the work that has been done to date, UW-La Crosse has completed the design and planning effort through 10% for Phase 2 of the Science Labs Building project. As outlined in the 2011 Pre-Design Study, Phase 1 focused solely on the design and construction of new laboratory space and forgoing new offices, classrooms, and less intensive laboratory space until Phase 2. With the construction of Phase 1 slated for completion in the summer of 2018, UW-L has established a building program and design to complete the entire facility in the upcoming future.

1.2 Approach

This project will demolish the 54-year old Cowley Hall and construct a new facility connected to Phase 1. Phase 2 will include office, classroom, instructional lab, research lab, and a number of highly specialized spaces that are critical to the overall delivery of science instruction and learning at UW-La Crosse.

The goal of this project is to create a space that is highly functional to the science programs while blending seamlessly with Phase 1. Primary entrances are located in a way to best serve the needs of students, faculty, and the public. Larger classrooms are to be located on the lower levels to help reduce the use of stairs and elevators during class changes. Laboratory space that was not included in Phase 1 is desired to be located within the connecting link between the two buildings. The Dean's office is strategically located on Level 1 in order to provide as much visibility to students as possible. Specialty spaces that are vital to the science program have been carefully planned and located. These include a lower level animal care facility, rooftop observatory, maker lab, greenhouse, and specimen museum.

Building systems have been carefully planned and integrated into the overall design. Recognizing the complexities of the laboratories, the design team worked to plan a comprehensive solution that took into account laboratory exhaust and fresh air intake from both phases, noise and vibration isolation, emergency power, etc.

1.3 Program Summary

Continuing the programming efforts that were verified in Phase 1, the design team worked with the Design Committee and each department to verify and strengthen the building program that had been developed. Three programming meetings were held with the departments where guideplate information was used to verify the layouts and functions of the various laboratory and classroom spaces. Departments identified their staffing requirements and provided insight to expected future needs in terms of faculty offices, which have been accounted for in the current building program.

Classroom utilization was studied as part of this program verification process. Leading up to now, the classroom quantity and size were based on the campus-wide space needs analysis conducted in 2014 and 2015. At that time, because of the uncertainty of the timing of this project, the classrooms in existing Cowley Hall were used as a placeholder. Analysis was conducted during the program verification process and the decision was made by the Executive Committee to include 9 total classroom spaces in this project. UW-La Crosse recognizes that there may not be a campus-wide need for classrooms, but feels strongly that this science facility must retain instructional space to deliver quality science instruction. While faculty can teach general science courses in other buildings on campus, demonstration and prep space is a programmatic requirement that the campus recognizes needs to be delivered. Prep/storage rooms will be

located adjacent to these classrooms and will provide space for demonstration setup and experiments without compromising class time; something that cannot be accommodated in other buildings.

Laboratory and specialized research space that was not included in Phase 1 will be provided as part of this Phase 2 project. These include a grade-level greenhouse, rooftop observatory, and lower level animal care facility. A number of computational research spaces are also included as part of the building program.

Since the focus of spaces included in Phase 1 was 100% instructional and research labs, office space is needed for the faculty and support staff. UW-La Crosse has acknowledged the need for privacy between student and faculty within the office environment and has requested that enclosed spaces be provided. Shared opportunities for lab support staff, student workers, teaching assistants and graduate students are being explored and will be accommodated whenever possible. To lessen the amount of square footage and retain a welcoming experience for the students, the faculty offices will located off of primary corridors rather than within departmental suites. It is anticipated that faculty offices will be mixed throughout the building based on thematic organization rather than by departments. Similar to the research labs included in Phase 1, this approach gives faculty with shared interests more opportunity to collaborate on special projects rather than being tethered to their department. Space planning for Phase 2 is based on the same flexible lab planning module of 10'-6" used in Phase 1.

Classrooms:

There are currently 9 total classrooms included in the building program, ranging from 40 seats to 150 seats. A 72-seat active learning style classroom is also included. Four classroom support/prep spaces are included to help reduce the preparation and setup time that is required for many of the science courses.

Instructional Laboratories:

Various instructional laboratory types are included in the building program. These include Medical Mycology, Botany, Science Education Methods, Chemistry and Physics Computational Labs, GIS Labs, and Mathematics Labs. These spaces carry various degrees of complexity and are primarily located as close to Phase 1 as possible.

Research Laboratories:
Research classified spaces included in the building program range from computational spaces to high-end animal care facilities. These include a Greenhouse, Statistics Consulting, Animal Care Facility, Rooftop Observatory, and four faculty/student research spaces.

Miscellaneous Instructional Support:
A number of spaces are included in the project to help support the learning environment and overall building function. Spaces include Student Collaborative Learning Spaces, a Maker Lab, Conference Rooms, Shared Printing Rooms, Testing Areas, Vending Areas, Cyber Café, and Faculty Resource Areas.

Departmental Offices and Office Support:
Six different departments associated with the College of Science and Health are to be co-located within the project. Biology, Chemistry, Geography & Earth Science, Mathematics, Microbiology, and Physics as well as the Dean's Office are included as part of the building program.

The following space tabulation provides a departmental summary of the spaces included in the project. A complete breakdown will be included with the full 10% Concept Report.

Program Summary		Program	Concept Design
1	General Access Classrooms	16,836	15,210
2	Miscellaneous Instructional Support	19,904	20,387
3	Biology	21,416	20,541
4	Chemistry	7,546	7,295
5	Geography & Earth Science	5,212	5,715
6	Mathematics	10,253	9,635
7	Microbiology	3,403	3,505
8	Physics	5,510	5,309
11	College of Science & Health – Dean's Office	2,474	2,753
12	Building Support	1,250	3,442
Total Assignable Square Feet (ASF)		93,804	93,792
Total Gross Square Feet (GSF)		156,340	164,255

1.4 Project Budget

The project budget currently allocated for Phase 2 of the Science Labs Building is $69,596,800, which includes construction, design, and equipment as if the project were to begin construction in the summer of 2021. Additional scenarios were evaluated for reference as part of this cost estimating process. Construction costs include demolition of existing Cowley Hall and exclude hazardous materials abatement.

Item/Description	2021 Start	2023 Start
Construction	$52,767,600	$56,860,000
DDC Controls	$1,259,625	$1,259,625
Contingency (7.5% of Construction)	$3,957,570	$4,264,500
A/E Fees (8% of Construction)	$4,221,400	$4,548,800
DFDM Management Fees (4% of Construction)	$2,110,700	$2,274,400
Other Fees (1% of Construction)	$527,700	$568,600
Moveable Equipment & Furnishings (3% of Construction)	$1,583,000	$1,705,800
Audio-Visual Equipment	$1,850,000	$1,850,000
TOTAL	$68,277,595	$73,331,725

Cost Adjustment Options:

1. Remove Animal Care Facility Build-Out (Construction Only)	-$3,500,000	-$3,800,000
2. Remove Maker Lab Build-Out (Construction Only)	-$175,000	-$185,000
3. Accelerated Schedule (Total Project Budget)	-$2,220,000	-$7,275,000

1.5 Project Schedule

Construction activities for Phase 1 are expected to be complete by the summer of 2018, providing full occupancy for the fall semester. While Cowley Hall will remain in use, instructional labs will be operation in Phase 1, leaving much of existing Cowley Hall empty and unutilized. When the project does start, UW-La Crosse intends to temporarily relocate faculty offices to surge space in the existing Cartwright Center. While UW-La Crosse would prefer to start construction of Phase 2 immediately, there is currently no enumeration of the project at the State level.

2.1 Introduction

Program

This facility is intended to serve as the primary home of the College of Science and Health (SAH) on the university's main campus. It has been programmed to meet the college's needs in two phases. The first phase was intended to meet an existing and future need for instructional and research lab spaces meeting contemporary guidelines. These facilities are intended to replace existing facilities currently located in Cowley Hall.

This project (Phase 2) will accommodate the needs for the remaining instructional and support spaces to complete the transfer of instruction and support out of existing Cowley Hall. Included in this portion of the program are faculty and administrative offices for SAH, specialty spaces for the various departments (e.g. research and instructional labs), shared classrooms, and collaborative spaces intended to support student life and public outreach (e.g. café, collections display/museum space). Spaces allocated for Phase 2 were initially identified in the 2011 Pre-Design Study, verified in Phase 1, and now confirmed for design and implementation.

Verification Method & Process

During the verification process, the design team met with representative groups from the various departments to review the quantities and sizes of the spaces described by the pre-design program, and to confirm that feedback provided during the program verification exercises was still applicable.

Using the established program as the starting point, the design team compiled guideplate diagrams to review during the first of three verification meetings. These diagrams helped the faculty visualize the spaces from a functional standpoint and validate the requirements.

2.2 Occupants/Users and Activities

Classrooms

Paulien & Associates, Inc. (Denver, CO) worked under contract to River Architects (LA Crosse, WI) for this project. The focus of Paulien & Associates' work was to develop a classroom space allocation program for the Science Labs Building Phase 2 program update on the University of Wisconsin – La Crosse campus.

The process of determining the space program began by collecting and disseminating data, conference calls with the project team and review of the meeting minutes that the project team held with each of the departments, the Executive Committee and others as appropriate. Data included existing classroom facilities information for Cowley Hall and a course file from fall 2016 for all courses taught in Cowley Hall. The UW System updated expectations for utilization of classrooms statewide was used to develop the program. A preliminary space program was submitted September 18, 2017. Several follow-up conversations, data refinement and project team meetings with shareholders resulted in refinement of the space program, and the result is shown in this document.

The space allocation program is determined as assignable square feet (ASF). During architectural design, the Architects will convert the ASF to gross square feet (GSF). The GSF includes public restrooms, primary circulation, elevator shafts, stairways, mechanical/electrical areas, and structural areas.

Cowley Hall is understood to presently contain eleven spaces used as classrooms (Space Use Code 110) for lecture type courses. The list of classrooms is as follows:

1. CH100 - Fixed stations
2. CH103 - Moveable tables and chairs
3. Ch111 - Moveable tables and chairs
4. CH140 - Fixed stations
5. Ch151 - Moveable stations
6. CH156 - Fixed stations
7. CH201 - Moveable stations
8. CH215 - Moveable stations
9. CH301 - Moveable stations
10. CH43 - Moveable tables and chairs
11. CH47 - Moveable tables and chairs

The classrooms total 12,837 ASF and contain 849 stations. The existing eleven classrooms currently average approximated 27 weekly room hours (WRH) of use.

The fall 2016 course file was forwarded to the consultant. Courses with building and room numbers corresponding to the above classroom list were extracted from the data base. Weekly room hours (WRH) were calculated for each of these courses. All cross listed courses were consolidated so that WRH's were not duplicated. It was assumed that all courses with less than or equal to 14 enrolled (10 total courses) would be taught in a conference or meeting room. A total of 276 WRH was calculated for the remaining courses.
The resultant courses were then sorted by enrollment and the WRH calculated to the UW System expectation of 40 WRH per classroom (up from the 35 WRH expectation of all previous studies). The average (arithmetic mean) of the enrollment in that group of courses was then applied at an approximate 80% student station occupancy to the mean. The outcome was reviewed and student stations were adjusted to an even number of stations and that there were no less than six stations available over the highest enrollment course in the grouping.

The analysis only includes courses presently taught in existing classrooms. The analysis does not include anticipation for enrollment increases per the meeting notes and memos. It also does not include any course presently taught in a different room but that may want to be taught in one of these classrooms.

The preliminary outcomes resulted in the need for seven classrooms varying from 30 to 124 stations and containing various station configurations from fixed seats to moveable tables and chairs. These seven classrooms from a strictly guideline generated data set would have between 38 and 41 WRH in each room and an approximately 80% student station occupancy (SSO). The preliminary findings were reviewed in team meetings and with all the constituent groups.

Concerns of the preliminary classroom program were voiced from both a quantity of classrooms perspective as well as the SSO. Some of these concerns are as follows:

a) Concerns regarding the future trends in course sizes.
b) Overall concern by the Committee about the loss of big rooms.
c) Understandings of the schedule of other departments as some courses align departmentally.
d) Large lecture halls accommodate more than just academic courses. Numerous outreach programs and guest speakers are held in these spaces.
e) The UW System updated expectation of classroom use are guidelines not necessarily absolutes.
f) Classroom station sizes would work best if they we more consistent so as to optimize design layout.
g) Reducing the total classrooms from eleven to seven may not allow students the flexibility to schedule courses to meet graduation needs.
h) Classrooms may be used for laboratory discussion space outside of scheduled classroom times.

The calculated 276 WRH from the course file results in over 39 WRH per room. If eight classrooms are included in the program the resultant WRH would be almost 35 WRH per room. This is well above the 27 WRH current use of these rooms. It is recommended that eight classrooms be included in the program for Phase 2 of the Cowley Hall Science Building.

This program provides 632 student stations in the 13,956 ASF of space in eight total classrooms. The 960 ASF lecture prep and storage spaces are assumed to be located within close proximity to the large lecture halls. These spaces will allow for storage and preparation of experimental and other materials presented during large group lectures. The classroom space program reflects the types and amounts of space understood to be needed to meet the goals of the departments and programs that will be housed in Cowley Hall and used by non-Cowley Hall departments. The amount of space allocated may change during the architectural design and construction to accommodate spaces within the building, project budget considerations and issues not yet discovered at the time of this assessment.

40 and 50-Seat Classrooms

Classrooms of this size will provide flexible seating arrangement through the use of movable tables and chairs. Each room will be equipped with marker boards, single projection screen, video/data projector, zoned lighting control, darkening shades, voice and data connections, and classroom technology as identified in the audiovisual description of this report.

80-Seat Classroom

Similar features as noted in the 40 and 50 seat classrooms with the exception of the 80 seat classrooms will feature tiered seating comprised of two rows of fixed tables and movable chairs per tier that will be accessible by ramp. Dual projection screens will be provided along with the classroom technology identified in the audiovisual description of this report.

72-Seat Active Learning Classroom

With active learning gaining popularity across the nation, the science faculty at UW-La Crosse recognize the benefits to the students by adapting this teaching pedagogy. The Design Committee felt that a 72-seat active learning classroom would be the most beneficial to the science program. This technology-rich environment will provide displays for groups of 6 students to collaborate and share information with other groups.

150-Seat Classroom

Similar features as noted in the 40, 50, and 80 seat classrooms with the exception of the 150 seat classrooms will feature rows of fixed theater type seating that will be accessible by ramp. Dual projection screens will be provided along with the classroom technology identified in the audiovisual description of this report.

Classroom Support

One of the biggest challenges the faculty of the science programs face is inadequate space to prepare course materials between classes. Adjacent support/prep space will provide space for demonstration and experiment setup without compromising scheduled course hours. Each room will be equipped with water, compressed air, storage, and benchtop work space. Faculty have requested movable tables be provided within each support space that can be mobilized for course instruction.

UNIT NO.	UNIT	NO. OF OCCUPANTS	ASF/ OCCUPANT	ASF/ SPACE	NO. OF SPACES	PROGRAM TOTAL ASF	CONCEPT DESIGN
1	Classrooms						
1A.1-2	40 Seat Classroom	40	25	1000	2	2000	2140
1B.1-2	50 Seat Classroom	50	25	1250	2	2500	2230
1C.1-2	80 Seat Classroom	80	24	1920	2	3840	3780
1D	72 Seat Active Learning Classroom	72	38	2736	1	2736	2040
1E.1-2	150 Seat Classroom	150	16	2400	2	4800	3730
1F.1-4	Classroom Support			240	4	960	1290
Classroom Total						16836	15210

Miscellaneous Instructional/Support Spaces

Spaces allocated as Miscellaneous Instructional/Support Spaces are those that provide additional resources for the classroom and laboratory spaces identified for this project. Spaces include shared conference rooms, printing and testing rooms, collaborative learning spaces, faculty resource area, and cyber café.

Science Education Methods

The primary focus of Science Education Methods is to prepare students for the delivery of science instruction to elementary and middle school curriculum. The methods lab is to be designed to replicate a general-purpose science lab in a K-12 setting. Adjacent support space will allow faculty to prepare experiments and demonstrations without compromising instructional hours. The Science Education Methods Lab will be used by Physics at various times throughout the year, primarily at exam time.

Student Collaborative Learning Spaces

Collaborative learning spaces include open lounge areas, enclosed quiet study spaces, and enclosed group study areas equipped with technology. All stakeholders agreed that these functions should be dispersed on all levels of the building rather than concentrated on one level.

Testing Rooms

Faculty raised concern early on the design programming process that there are no spaces for students to take make-up exams. Four spaces have been provided for this function and because of their adjacency to faculty offices, could serve as faculty huddle space if not being used.

Conference Rooms

Four general purpose conference rooms are to be distributed throughout the building to provide departments with a means of having meetings of 16 to 20 people. Conference rooms will be equipped with technology, writable surfaces, and movable furnishings.

Shared Printing Rooms

The science programs all have a need for large format printing and high-volume printing. These are to be located throughout the building to better serve the faculty.

Shop

Because the science programs tend to deal with an ever-changing curriculum and need to provide the best visual reference to students, faculty are continually needing to fabricate sizable demonstration aides and or repair or modify laboratory equipment to better suit their needs. The shop area consists of two areas. The clean side will provide space where work can be conducted on such things as electronics or optics equipment in a dust-free environment. The dirty side of the shop will house wood and metalworking equipment and feature a dust control system.

Maker Lab

The science faculty at UW-La Crosse are an interactive consortium of individuals that are looking for more opportunities to collaborate with one another on various projects. While this area needs more programmatic definition, the maker space is envisioned as a do-it-yourself area where faculty can gather and work on projects in a collaborative environment. It's adjacency to the shop and collaborative learning area make it a great fit for faculty to come together and continue to build professional relationships in their various fields of interest.

Faculty Resource Center

Much like collaborative learning spaces for students, faculty also need space outside of their office, lab, or classroom, to decompress from the everyday challenges of the work environment. These resource areas will feature soft seating, writable surfaces, technology, sink, refrigerator, and microwave. Faculty huddle/collaboration space is also planned to occur near this area.

Cyber Café

As with many academic buildings where students and faculty are located for many hours of the day, the café area will provide food and beverage and collaborative learning opportunities with soft seating. At this time, UW-La Crosse intends this space as a serving area only without any food preparation.

Student Organization

The science programs all have student organizations that meet on a regular basis. While most meetings are held in the Student Center, the organizations themselves need a touch-down space for storage and small group discussions.

Specimen Museum

UW-La Crosse has a very large collection of display specimen that contributes the student's learning experience during their time on campus. Displays range in size and type and includes birds, fish, insects, rocks and minerals, etc.

UNIT NO.	UNIT	NO. OF OCCUPANTS	ASF/ OCCUPANT	ASF/ SPACE	NO. OF SPACES	PROGRAM TOTAL ASF	CONCEPT DESIGN
2	Misc. Instructional Support						
2A1	Science Education Methods Lab	30	45	1350	1	1350	1160
2A2.1-2	Science Education Methods Lab Prep			640	2	1280	845
2A3	Science Education Research Lab	4	80	320	1	320	290
2A4	Science Education Methods Resource	4	80	320	1	320	290
2C	Student Collaborative Learning Spaces			841	4	3364	4070
2D.1-4	Testing Rooms	2	60	120	4	480	345
2F.1-4	Conference Rooms	20	30	600	4	2400	1960
2G.1-4	Shared Printing Areas			120	4	480	465
2J1	Shop (Dirty)			960	1	960	1095
2J2	Shop (Clean)			320	1	320	330
2J3	Maker Lab			1500	1	1500	1445
2K.1-2	Faculty Resource Center			640	2	1280	1395
2L.1-4	Vending & Seating Area			320	4	1280	1010
2M	Cyber Café			1000	1	1000	1290
2N	Student Organization Space	6	60	360	1	360	445
2P1	Specimen Museum: Display Specimen			640	1	640	785
2P2	Specimen Museum: Table & Chairs			750	1	750	890
2P3	Specimen Museum: Rock Collection			160	1	160	57
2P4.1-2	Specimen Museum: Non-Display			320	2	640	725
2P5	Specimen Museum: Herbarium			960	1	960	925
2P6	Specimen Museum: Office	1	60	60	1	60	110
	Vacant Office						460
Misc. Instructional Support Total						19904	20387

Biology Department

The Department of Biology is structured to provide both survey-and major-level courses in the study of living organisms and systems from the cellular to organism and ecosystem levels. While many of the biology labs were incorporated into Phase 1, four highly specialized spaces are being planned for Phase 2. All of the instructional and research activities that occur within the current spaces of existing Cowley Hall will be required to be offline for the duration of construction of Phase 2.

Botany & Mycology Lab

The Botany/Mycology Lab space is for course sizes up to 24 students and is to be located adjacent to the Greenhouse. Lab will be equipped with technology, writable surfaces, and movable furnishings.

Medical Mycology Lab

Medical Mycology Lab space is for course sizes up to 16 students and is to be located near the Botany Lab and Greenhouse. Adjacent biological safety cabinet room will be provided. Lab will be equipped with technology, writable surfaces, and movable furnishings.

Animal Care Facility

Animal holding rooms, procedures rooms, cage washing facilities, food and prep storage, etc. are being planned for the lower level. The current facility located off-campus us undersized and does not meet NIH guidelines, nor is it AAALAC accredited, both of which are to be met with this new facility. Stand-alone mechanical systems and access are necessary and are being planned as part of this facility along with secured entrances and private elevator.

Greenhouse

The existing greenhouse facility on the fourth floor of Cowley Hall is in very poor condition. UW-La Crosse has chosen to make the greenhouse facility more of a feature to visiting students and the public and prefers that it located at grade. Because of its adjacency to the Botany Lab and corresponding support spaces, there will be a benefit to students and faculty to have these functions connected and sharing resources.

UNIT NO.	UNIT	NO. OF OCCUPANTS	ASF/ OCCUPANT	ASF/ SPACE	NO. OF SPACES	PROGRAM TOTAL ASF	CONCEPT DESIGN
Biology							
3A	Department Chair's Office	1	120	120	1	120	135
3B.1-30	Ranked Faculty Office	1	120	120	30	3600	3450
3C.1-2	Future Ranked Faculty Office	1	120	120	2	240	230
3D.1-9	Lecturer - Full Time	1	120	120	9	1080	1035
3E	Lecturer - Part Time	1	120	120	1	120	115
3F1.1-2	Academic Department Associate	1	80	80	2	160	107
3F3.1-2	Student Workers	1	35	35	2	70	105
3F4	Reception Area	6	25	150	1	150	105
3F5	Storage Cabinets	1	12	12	1	12	0
3F6	Lateral Files	1	66	66	1	66	117
3G	Secure Office Storage	1	120	120	1	120	117
3H	Work Room	1	120	120	2	240	120
3I.1-6	Teaching Assistants	2	60	120	6	720	690
3J.1-6	Graduate Assistants	2	60	120	6	720	690
3K.1-3	Lab Support Staff	1	120	120	3	360	345
3P	Botany and Mycology Lab	24		1280	1	1280	1100
3P1	Biosafety Cabinet Room	1	320	320	1	320	305
3P2	Medical Mycology Lab	16	60	960	1	960	860
3S3	Botany Prep/Storage	1	320	320	1	320	285
3Y1.1-7	Animal Rooms	1	120	120	7	840	800
3Y2.1-3	Procedures Room	1	290	290	3	870	825
3Y3	Cage Wash	1	546	546	1	546	395
3Y4	Storage Cabinets	1	320	320	1	320	205
3Y4B	Storage	0	0	0	0	0	155
3Y4C	Storage	0	0	0	0	0	360
3Y5	Dirty Room	1	453	453	1	453	605
3Y6	Lab Manager	1	120	120	1	120	105
3Y7	Hibernacula	1	120	120	1	120	120
3Y8	Barrier Suite	1	140	140	1	140	260
3Y9	Quarantine	1	110	110	1	110	125
3Y10	Cage Storage	1	343	343	1	343	575
3Y11.1-2	Restroom w/Lockers	1	277	277	2	554	220
3Y12	Janitors Closet	1	30	30	1	30	50
3Y13	Vivarium Circulation	0	0	2090	1	2090	1735
3Y14	Vivarium Mechanical	0	0	1700	1	1700	1440
3Y15	Food Prep & Storage	1	255	255	1	255	250
3Y16	Ante-Room	1	187	187	1	187	130
3Y17	Carcus Holding	0	0	0	0	0	85
3AA1	Greenhouse: Greenhouse	1	1280	1280	1	1280	1315
3AA2	Greenhouse: Headhouse	1	320	320	1	320	285
3AA3	Greenhouse: Aquatics Space	1	160	160	1	160	290
3AA4	Greenhouse: Isolation Space	1	320	320	1	320	300
Biology Total						21416	20541

Chemistry Department

The Department of Chemistry & Biochemistry provides survey and major undergraduate-level courses in the major sub-fields of Chemistry. The Chemistry labs identified in this building program were delayed until Phase 2 due to their computational nature. These spaces will provide both instructional and research opportunities to faculty and students.

General Chemistry/Analytical Computer Lab

Computational space for 30 students using specialized computers to run analytical analysis related to the Chemistry program. Lab will be equipped with technology, writable surfaces, and movable furnishings.

Shared Chemistry Computer Lab

Computational space for 18 to 20 students working in groups of four. Lab will be equipped with technology, writable surfaces, and movable furnishings.

Faculty/Student Research (Computational)

This 200sf research space was not included in Phase 1 due to its computational program will include furnishings to accommodate this computer-based research.

UNIT NO.	UNIT	NO. OF OCCUPANTS	ASF/ OCCUPANT	ASF/ SPACE	NO. OF SPACES	PROGRAM TOTAL ASF	CONCEPT DESIGN
Chemistry							
4A	Department Chair's Office	1	120	120	1	120	115
4B.1-20	Ranked Faculty Office	1	120	120	20	2400	2300
4C.1-4	Future Ranked Faculty Office	1	120	120	4	480	460
4D.1-11	Lecturer - Full Time	1	120	120	11	1320	1265
4F1	Academic Department Associate	1	80	80	1	80	120
4F2	Future Support Staff	1	80	80	1	80	0
4F3.1-2	Student Workers	1	35	35	2	70	120
4F4	Reception Area	6	25	150	1	150	130
4F5	Lateral Files	6	11	66	1	66	120
4G	Work Room	1	120	120	1	120	125
4H	Secure Storage	1	120	120	1	120	130
4I.1-2	Lab Support Staff	1	120	120	2	240	230
4J.1-2	Student Workers	6	35	210	2	420	460
4T	Gen Chem/Analytical Computer Lab	30	35	1050	1	1050	890
4U	Shared Chemistry Computer Lab	18	35	630	1	630	595
4W	Faculty/Student Research (computational)	1	200	200	1	200	235
Chemistry Total						7546	7295

Geography & Earth Science Department

The Department of Geography & Earth Science provides introductory and advanced undergraduate instruction in geography, cartography, climatology, and the technical processes for quantifying and recording the results of these studies. Coursework relies heavily on field study, including the collection, preparation, and use of field samples.

Introductory GIS Lab

Computational lab space for 32 students using highly specialized computers and software related to the learning of geographic information systems (GIS). Users requested that this room have a tiered floor and will be equipped with technology, writable surfaces, and fixed tables with movable chairs.

Advanced GIS Lab

The Advanced GIS Lab is to have the same features as the Introductory GIS Lab noted above.

Faculty/Student Research (Computational)

The shared computational research space will feature movable furnishings with computers and large format plotter. A large map table with digital displays and writing surface are also planned for this space.

UNIT NO.	UNIT	NO. OF OCCUPANTS	ASF/ OCCUPANT	ASF/ SPACE	NO. OF SPACES	PROGRAM TOTAL ASF	CONCEPT DESIGN
Geography & Earth Science							
5A	Department Chair's Office	1	120	120	1	120	135
5B.1-9	Ranked Faculty Office	1	120	120	9	1080	1035
5D1	Lecturer - Full Time	1	120	120	1	120	115
5D2	Lecturer - Part Time	1	60	60	1	60	115
5D3	Lab Manager	1	120	120	1	120	125
5E1	Academic Department Associate	1	80	80	1	80	105
5E2	Student Workers	1	35	35	1	35	105
5E3	Reception Area	4	25	100	1	100	105
5E4	Lateral Files	3	11	33	1	33	120
5F	Office Storage	1	120	120	1	120	120
5G	Work Room	1	120	120	1	120	120
5J	Introductory GIS Lab	32	36	1152	1	1152	1350
5K1	Advanced GIS Lab	32	36	1152	1	1152	1335
5N	Faculty/Student Research (computational)	5	160	800	1	800	595
5P	Storage	1	120	120	1	120	235
Geography & Earth Science Total						5212	5715

Mathematics Department

The Department of Mathematics provides survey and advanced instruction to students enrolled in all colleges at the University. The department utilizes didactic and active learning environments for instruction, as well as computer-intensive lab spaces for instruction and computation. No wet lab space is needed for this department.

Mathematics Education

The two Mathematics Education Labs are for course sizes up to 36 students and are to be located near each other. Adjacent prep/storage room will be provided. Labs will be equipped with technology, writable surfaces, and movable furnishings.

Statistics Consulting Center

Provides collaborative setting for up to 12 people to provide support for both on and off-campus clients while providing undergraduate students professional data analytic experiences.

Undergraduate Research Library

Provides collaborative setting for up to 20 people to work in small groups with computers and technology provided.

UNIT NO.	UNIT	NO. OF OCCUPANTS	ASF/ OCCUPANT	ASF/ SPACE	NO. OF SPACES	PROGRAM TOTAL ASF	CONCEPT DESIGN
Mathematics							
6A	Department Chair's Office	1	120	120	1	120	135
6B.1-30	Ranked Faculty Office	1	120	120	30	3600	3450
6C	Future Ranked Faculty Office	1	120	120	1	120	115
6D.1-10	Lecturer - Full Time	1	120	120	10	1200	1150
6G1.1-2	Academic Department Associate	1	80	80	2	160	110
6G3	Student Workers	1	35	35	1	35	105
6G4	Reception Area	8	25	200	1	200	105
6G5	Lateral Files	3	11	33	1	33	120
6I	Work Room	1	120	120	1	120	120
6J	Office Storage	1	120	120	1	120	120
6K.1-2	Math Education Space	36	35	1260	2	2520	2160
6K1	Math Education Support	1	320	320	1	320	290
6L1	Math Research Team Room	16	30	480	1	480	575
6L2	Statistics Consulting Center	12	20	240	1	240	345
6M1	Undergrad Research Lib: Bookshelves	20	4	80	1	80	735
6M2	Undergrad Research Lib: Seating	4	40	160	1	160	0
6M3	Undergrad Research Lib: Computers	5	35	175	1	175	0
6M4	Undergrad Research Lib: Tables & Chairs	15	30	450	1	450	0
6N	Math Education Storage	1	120	120	1	120	0
Mathematics Total						10253	9635

Microbiology Department

The Department of Microbiology provides baccalaureate and masters-level instruction. The department offers basic science degrees, as well as a Major in Clinical Laboratory Science.

Microbiology has no lab or specialty spaces programmed for this phase of the project.

UNIT NO.	UNIT	NO. OF OCCUPANTS	ASF/ OCCUPANT	ASF/ SPACE	NO. OF SPACES	PROGRAM TOTAL ASF	CONCEPT DESIGN
Microbiology							
7A	Department Chair's Office	1	120	120	1	120	115
7B.1-7	Ranked Faculty Office	1	120	120	7	840	805
7C	Future Ranked Faculty Office	1	120	120	1	120	115
7D.1-4	Lecturer - Full Time	1	120	120	4	480	460
7E1	Academic Department Associate	1	80	80	1	80	120
7E2.1-2	Student Workers	1	35	35	2	70	120
7E3	Reception Area	4	25	100	1	100	130
7E4	Lateral Files	3	11	33	1	33	120
7F.1-8	Grad Assistants	2	60	120	8	960	920
7G	Office Storage	1	120	120	1	120	130
7H.1-3	Lab Support Staff	1	120	120	3	360	345
7I	Work Room	1	120	120	1	120	125
Microbiology Total						3403	3505

Physics Department

The Physics Department offers undergraduate-level instruction in physics with emphasis placed on undergraduate research opportunities. The Physics Department stands out in its emphasis on undergraduate research. The Physics Department is active in several areas of physics research. Students typically work with a faculty member on a research project in their specialty area. This mode of instruction gives students hands-on learning opportunities which are very different from the traditional classroom experience. The Physics Department has been highly successful in obtaining research grants and awards from many organizations, including the National Science Foundation and NASA.

Computational Computer Lab

Computational space for 20 students using specialized computers to run analytical analysis related to the Physics program. Lab will be equipped with technology, writable surfaces, and movable furnishings.

Faculty/Student Research (Theorists)

Computational research space for 14 people. Lab will be equipped with technology, writable surfaces, and movable furnishings.

Rooftop Observatory

Rooftop observation area for stargazing. An open observation platform along with an area for pier-mounted telescopes will be provided. Accessibility to the observation area required for all users.

UNIT NO.	UNIT	NO. OF OCCUPANTS	ASF/ OCCUPANT	ASF/ SPACE	NO. OF SPACES	PROGRAM TOTAL ASF	CONCEPT DESIGN
Physics							
8A	Department Chair's Office	1	120	120	1	120	115
8B.1-9	Ranked Faculty Office	1	120	120	9	1080	1035
8C	Future Ranked Faculty Office	1	120	120	1	120	115
8D.1-3	Lecturer - Full Time	3	60	180	3	540	345
8E.1-2	Academic Department Associate	1	80	80	2	160	120
8E2	Student Workers	1	35	35	1	35	120
8E3	Reception Area	4	25	100	1	100	130
8E4	Lateral Files	2	11	22	1	22	120
8F	Work Room	1	120	120	1	120	125
8G	Office Storage	1	120	120	1	120	130
8H	Lab Support Staff	1	120	120	1	120	81
8I	Student Workers (Lab Prep)	1	35	35	1	35	53
8I1	Instrumentation Specialist	1	120	120	1	120	105
8R	Computational Computer Lab	24	27	648	1	648	645
8T	Faculty/Student Research (Theorists)	2	320	640	1	640	540
8W1	Telescopes	6	60	360	1	360	360
8W2	Observation Plateform	50	15	750	1	750	750
8W3	Waiting Area	20	15	300	1	300	300
8W4	Storage	1	120	120	1	120	120
Physics Total						5510	5309

College of Science and Health – Dean's Office

The College of Science and Health (SAH) – Dean's Office, currently located in Graff Main Hall, oversees the departments of Biology, Chemistry, Geography & Earth Science, Mathematics, Microbiology, and Physics, all of which will be located within the new facility. Additional programs and departments under the College purview include Computer Science, Exercise and Sports Medicine, Health Education and Health Promotion, and Recreation Management.

The primary focus of the College of Science and Health is to provide an education in the diverse discipline of science, health, and mathematics. The College is dedicated to student learning where enthusiastic faculty and staff intellectually challenge students in a supportive and professional environment.

In addition to the office suite, the College requires secure storage and a large conference room. While the conference room will be contained within the Dean's suite, it will be available for general use.

UNIT NO.	UNIT	NO. OF OCCUPANTS	ASF/ OCCUPANT	ASF/ SPACE	NO. OF SPACES	PROGRAM TOTAL ASF	CONCEPT DESIGN
Dean's Office							
11A	Dean's Office	1	185	185	1	185	185
11B.1-2	Associate Dean's Office	1	145	145	2	290	236
11C	Assistant to Dean's Office	1	135	135	1	135	118
11D	Dean's Assistant	1	80	80	1	80	118
11E	Assistant to Dean	1	135	135	1	135	118
11F1	Academic Department Associate	1	80	80	1	80	92
11F2	Student Workers	1	120	120	1	120	130
11F3	Reception Area	6	25	150	1	150	220
11F4	Lateral Files	9	11	99	1	99	24
11G	Work Room	1	120	120	1	120	115
11H	Conference Room	16	30	480	1	480	705
11I	Storage	1	120	120	1	120	115
11J.1-3	Grad Assistant/Advisor	1	120	120	3	360	336
11K	Administrative Specialist	1	120	120	1	120	123
	Spare Office	1	120	120	0	0	118
Dean's Office Total						2474	2753

Building Support

Building operations spaces include IT closets, custodial maintenance rooms, mechanical rooms, and other spaces that allow the building to function. These are used almost exclusively by janitorial and maintenance staff. Other building support spaces support material intake, handling, and disposal processes. These include recycling collection, equipment and supply storage, etc.

The balance of programmed building support focuses on occupant circulation and experience within the building. These spaces include arrival spaces, recycling areas on each floor, and restrooms. All building occupants are anticipated users of these spaces, as this part of the program is integral to building circulation and occupant experience.

A central mailroom is required in this phase of the project and will serve as the primary space where mail is brought to the building. Each department is then responsible for collection of the mail from this space and distributing among their faculty and staff.

UNIT NO.	UNIT	NO. OF OCCUPANTS	ASF/ OCCUPANT	ASF/ SPACE	NO. OF SPACES	PROGRAM TOTAL ASF	CONCEPT DESIGN
Building Support							
12A	Arrival Space Primary	1	325	325	1	325	532
12B	Arrival Space Secondary	1	320	320	1	320	580
12C	Equipment Storage	1	125	125	1	125	100
12I.1-8	Recycling Area	1	25	25	4	100	100
12N.1-8	Gender Neutral Restrooms	1	70	70	4	280	90
12P	Central Mailroom	1	100	100	1	100	110
12S.1-5	Electrical/IT Rooms	1	120	120	4	480	1450
12T.1-5	Custodial Closets	1	80	80	4	320	480
Building Support Total						1250	3442

2.3 Building Program Summary

The following space tabulation is a summary of all assignable and non-assignable spaces outlined within this 10% Concept Report and compares the conceptual design assignable square footage to the program requirements as outlined. It should be noted that the total area depicted in the matrix below includes all mechanical spaces, including the mechanical penthouse.

UNIT NO.	UNIT	PROGRAM TOTAL ASF	CONCEPT DESIGN
1	Classrooms	16836	15210
2	Misc. Instructional Support	19904	20387
3	Biology	21416	20541
4	Chemistry	7546	7295
5	Geography & Earth Science	5212	5715
6	Mathematics	10253	9635
7	Microbiology	3403	3505
8	Physics	5510	5309
11	College of Science & Health - Dean's Office	2474	2753
12	Building Support	1250	3442
Building Program Total ASF		93804	93792

Note:
The Design Team will continue to monitor assignable square footages of the design and compare them to the Building Program. At this phase of the design, not every space has been identified in the conceptual floor plans. In an effort to control the effect of subsequent mechanical space, pipe chases, electrical closets, etc. the Design Team intends to locate these types of spaces in a manner that has minimal impact on the programmed needs of the project.

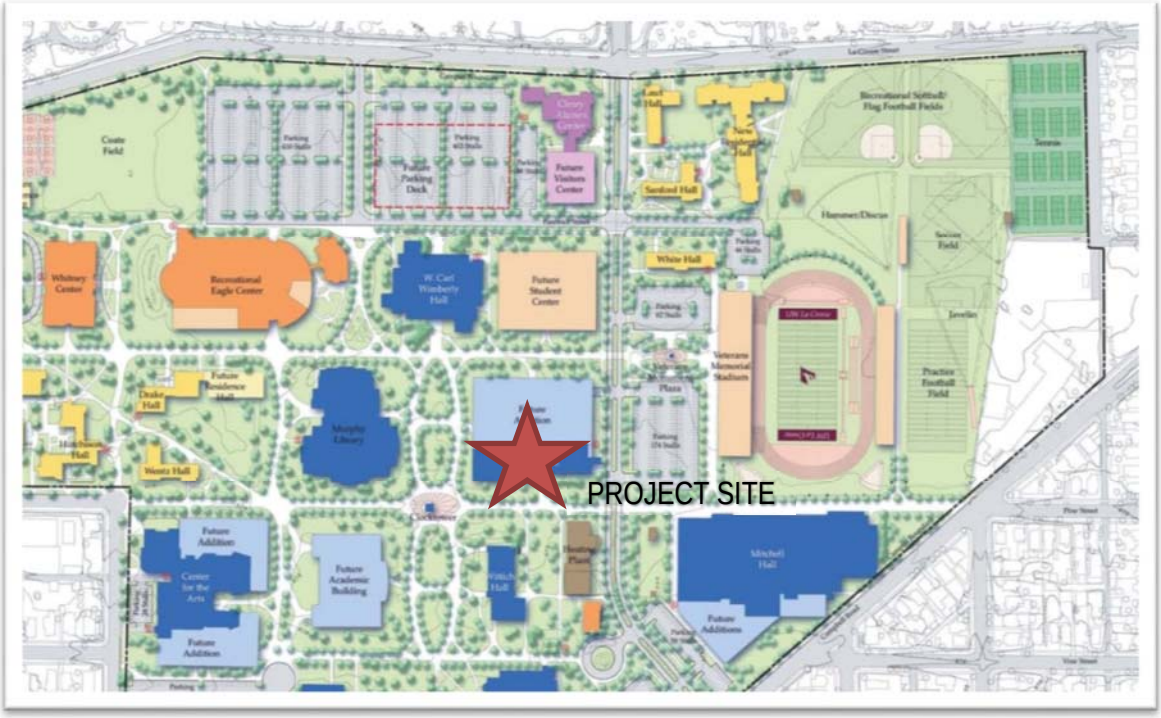
3.1 Site/Existing Conditions

3.1.1 Location & Proximity

Phase 2 of the project will use the existing Cowley Hall site immediately south of the Phase I building currently under construction. The site is a prominent location at the northeast corner of the main academic core of the University of Wisconsin-La Crosse campus. The Cowley Hall Science Building shares the academic core with Wimberly Hall to the north, Murphy Library directly across the Mall to the west, Centennial Hall to the southeast, Wing Technology Center at the south end of the Mall and Wittich Hall immediately south of the project. The north-south axis of this academic core is intended to be developed into a future Central Campus Mall from Wimberly to Wing, the first node of which will be constructed with the Phase I project site restoration.

North of the site across Badger Street (a pedestrian & bicycle only zone), is the new Student Center. Across East Avenue is Veteran's Memorial Stadium and entry plaza. In addition to the prominent mall/academic core location, the site also fronts on East Avenue which is Campus' primary vehicular thoroughfare. Primary campus access is at the signalized intersection of East Ave. and La Crosse St. 2 blocks north of the site, and the intersection of Pine St. and Campbell Road southeast of the site. As the site relates to student housing, it is centrally located though slightly closer to the northeast housing area.

The 2005 Campus Master Plan outlines many important factors that need to be considered during the development of the building and site. The Master Plan established three main principles: enhance the campus image and identity, create a Central Campus Mall within an enhanced academic core, and create a more walkable campus environment.



2005 Master Plan

The proposed site development will play an integral role in fulfilling the master plan. The location, massing and final design will need to enhance the campus image and identity as well as have a lasting effect on the academic core. The building will also play an interactive role for visitors as they enter and explore campus. Visitors will approach campus via the signalized intersection at East and La Crosse, be directed west onto Farwell St. and enter a new parking structure. Now on foot, visitors will interact with a proposed Visitor's Center on the corner of Farwell and East and the new Student Center. As they explore the rest of campus, visitors will cross the Badger St. pedestrian corridor and head for the Central Campus Mall, passing by or through the new Science Lab building.

In addition to the guiding principles there are notable physical and geographical campus changes in the Master Plan. East Ave. may eventually extend south and connect to Campbell Road directly. At such time the road geometry may be straightened. Badger St. is currently an abandoned road profile complete with curb and gutter, terrace on both sides and sidewalk along the north only. The Phase I Science Lab restoration plan will convert the first block into a pedestrian mall linking the Student Center and north tower of the Science Lab (phase 1). A future Central Campus Mall is planned for the north-south axis east of the site from Wimberly to Wing.

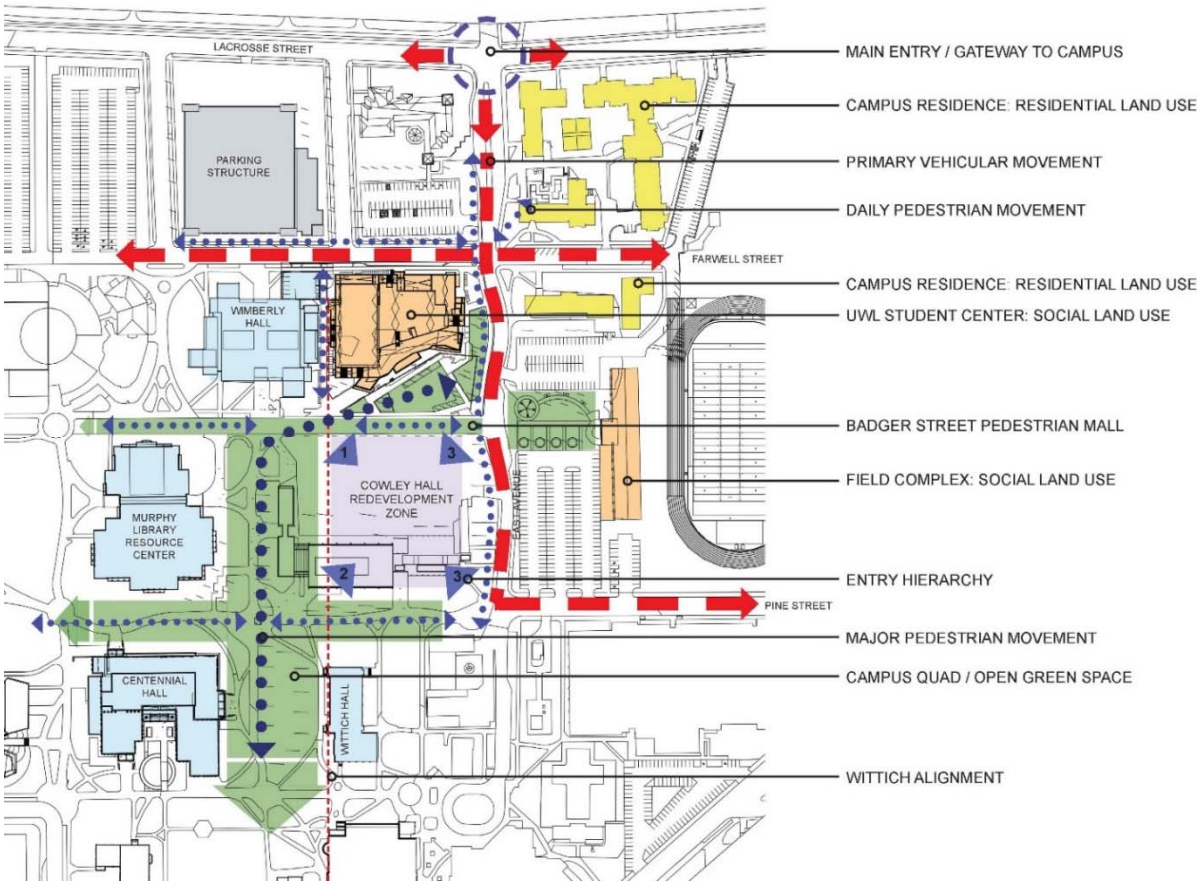
The Master Plan intentions and prominent campus location give this site a very urban character suggesting the new development provide for life and activity on all sides of the building. Given the site location on campus, proximity to the academic core and street frontages, no one side will be a back door. Future design development will need to be mindful of campus developments and these influences.

3.1.2 Site Analysis

The existing site is based on the typical City of La Crosse street grid. As with most areas of Campus, the streets have either been abandoned or are closed. The whole of the academic core is based on the street grid layout and as such most of the site utilities occur primarily in the corresponding grid layout (storm, sanitary, water, gas). Additional Campus utilities predominantly follow the same grid but some utilities do vary in location (i.e chilled water, steam, primary, and signal).

The south edge of the project has a primary and signal package encroaching into the project site. Final building placement, foundations and layout will need to assess the feasibility of maintaining these services as is or propose to relocate. Soil borings for the Phase I building reveal extremely sandy sub soils below a thin layer of topsoil. This soil structure creates ideal opportunities for infiltration. Unfortunately, the east half of this site resides in a City Well Head Protection Zone which places infiltration restrictions within that area alone. Areas of the site outside of this zone should be utilized for infiltration if possible.

The site is generally open and free of shade and in predominantly square to the cardinal directions. As such the site is subject to the winter winds from the northwest and summer winds from the southwest. Solar orientation is typical with the south face of the existing building in direct sun and the north portion subject to shadows. Proposed vegetation solutions and site snow removal considerations should be designed in that respect. Vegetation on site includes mature trees, foundation landscaping and miscellaneous landscape beds and sod but nothing of great significance. The site is proximal to the Campus iconic clock tower and the extent of site work around the clock to be included in the final site restoration should be considered early in the design development. Current scope for the UWL Science Lab project includes site restoration as it relates to the building design options, but does not include wholesale changes in the Central Campus Mall or clock tower areas. Care should be taken to protect and maintain conditions as feasible in the final project scope.

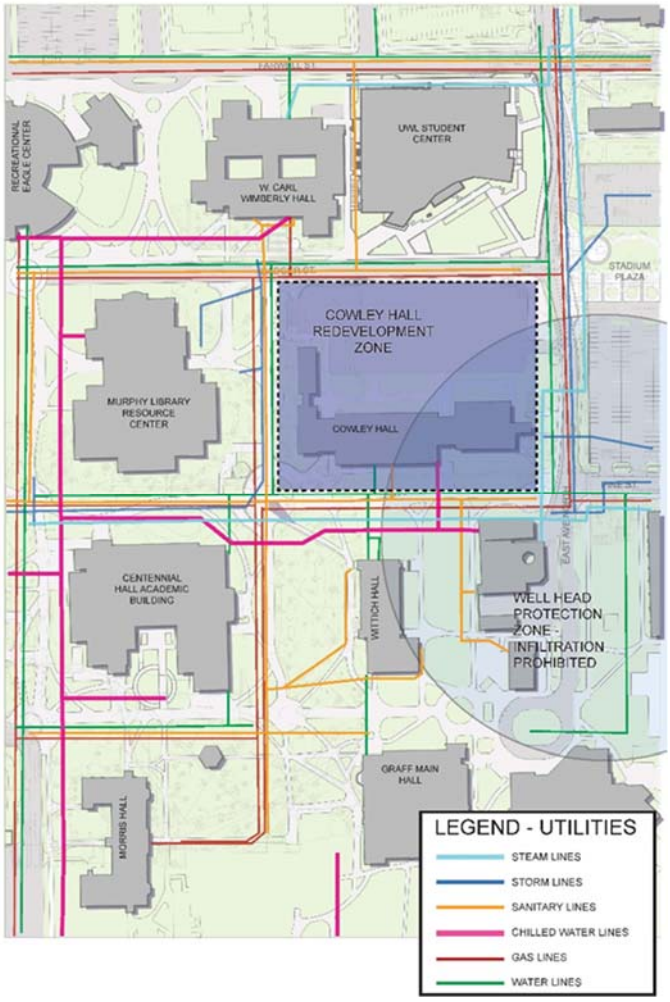


East Avenue is the main vehicular thoroughfare through campus and will remain as such as identified in the Campus Master Plan. East Avenue also carries a significant amount of pedestrian traffic on its sidewalks and the Stadium will continue to generate significant traffic and flow even if only limited to events. Pedestrian traffic in and around the project site is and will remain heavy due to the proximity to the Student Center, Wimberly, Murphy Library, Centennial Hall, and the anticipated renovation to Wittich.

3.2 Civil and Site Utility Plan

3.2.1 Water

The current Cowley Hall Science Building domestic water connection is located on the south side of the building. This service, size unknown, connects to a 20-inch water main that runs east-west through the old Pine Street abandoned right of way. A 6-inch main is also located on the east and west sides of the building site, creating a loop with the 6-inch main located within Badger Street. A fire flow test performed in June 2007 by the City on the 6-inch line near the corner of East Ave and Badger Street resulted in a flowrate of 1,706 gpm at a residual pressure of 55 psi (static pressure of 78 psi).



A private well is located on site that currently supplies clean well water for certain water-research laboratories. It is anticipated that this well will be abandoned and all water in the future for domestic, fire protection, and laboratory needs will be drawn from the public supply. The Design Team has assumed that no gray water will be collected and used for the building plumbing or irrigation.

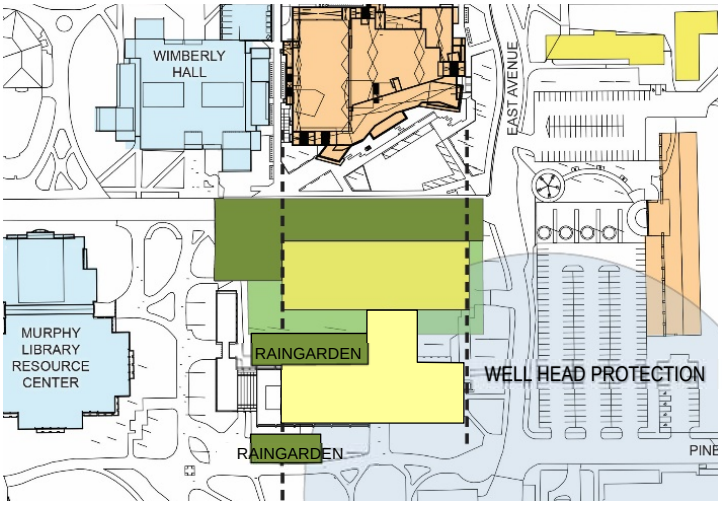
A 6-inch combined domestic and fire protection service is anticipated to support the Phase 2 addition's water demand. The existing Cowley Hall service will be investigated if it has sufficient flow and is in good condition to serve Phase 2. Should a new service be required, a 6-inch line will connect to the 20-inch main south of the building.

3.2.2 Storm

Drainage & Connections

The existing building has a storm connection for roof drainage near the center of the building on the south side. This storm pipe connects to a 36-inch storm sewer in the old Pine Street that flows west towards the Clock Tower.

There are several existing storm sewer systems near the project site. A 12-inch storm pipe runs towards the south along the mall west of the project site and connects to the 36-inch main at the Clock Tower. East of the existing Cowley Hall, within East Avenue, a 42-inch pipe flows north towards La Crosse Street. A cross connection between the 42-inch and the 36-inch pipes exists at the intersection of East Ave and Pine Street. The cross connection functions by allowing stormwater to flow in either direction (north or west).



The Design Team was involved in a storm sewer study for the watershed that the Science Lab project site is located. The results of the study indicated that the discharge pipe for the watershed, located several blocks west of the project site along Front Street, is undersized and the overland flow route for larger storm events is limited. Not increasing the amount of runoff for the proposed Science Lab site compared to the amount of existing runoff, is of great importance.

The area around the Clock Tower currently experiences flooding, according to the UW La Crosse Stormwater Management Plan (2008). This is apparently due to a combination of a lack of positive drainage and lack of capacity of the downstream system. To minimize impact to the storm system the Phase I Lab building site restoration includes three (3) rain garden areas to accommodate a majority of the roof and site runoff up to a 50-year rain event. The south tower site development should consider implementing rain gardens where feasible outside the well head protection zone to further reduce impact to the storm system. Any overflow of roof drainage should be directed to the 42-inch pipe in East Ave.

Infiltration, Peak Flow Reduction & Sediment Removal

Infiltration potential on the eastern half of the site is prohibited due to the fact that it is within 400 feet of a municipal water well. Soils in the area are generally sandy and have very high infiltration capacity.

Opportunities for treatment of total suspended solids (TSS) and peak flow reduction are somewhat limited on this site during the “interim” condition (after Phase 1 Lab building is built but before Phase 2 is done when the west wing will be demolished). The most effective best management practices (BMPs) would be a combination of grass swales and infiltration (rain gardens). The site lends itself better to having rain gardens on the west side of the building, where there is more space and is located outside of the well head protection zone. Because the storm sewer system is at or over capacity, the Design Team intends to infiltrate as much roof water and site runoff as possible, consistent with the approach for Phase 1.

This project is exempt from meeting the WDNR Stormwater Management goals outlined in NR151 because the project is considered a "redevelopment post-construction site with no increase in exposed parking lots or roads." However, the University understands City stormwater management goals and facilitates discussion regarding all major University projects with the City. The University (like the City) has a goal of reducing TSS from their runoff, and intends to do so by the maximum extent practicable. The City Stormwater Utility assesses fees against property owners (including the University) based on the amount of impervious area on a property. The Utility will allow credit reductions for property owners who employ BMPs to reduce stormwater peak flows as well as capture TSS. Therefore, the University benefits from employing BMPs to reduce the amount of Stormwater Utility fees imposed against the University.

The Division of State Facilities (DSF) has Sustainability Guidelines similar to the LEED rating system. Two credits (SS C6.1 and SS C6.2) relate to stormwater management, summarized as follows:

SS C6.1 – Stormwater Quantity: reduce the rate and volume of stormwater discharge by 25 percent for the 1.5-year, 24 hour storm event.

SS C6.2 – Stormwater Quality: capture 80 percent of TSS and 40 percent of total phosphorus (TP) from the runoff over no controls over an annualized period.
LEED has similar criteria for each credit. Both of these credits are achievable with the use of rain gardens and swales on this site to promote infiltration, but will require a portion of the building roof water to be directed to these areas.

In summary, with the use of rain gardens on the west side of the site and grass swales elsewhere around the building, it is possible to achieve the stormwater management goals as defined by DSF, WDNR, the City of La Crosse, and LEED.

3.2.3 Sanitary

The existing sanitary service, size unknown, from Cowley Hall is located on the south side of the building and discharges to a 10-inch sanitary sewer located within the abandoned Pine Street right-of–way. This sanitary sewer main drains to the west and connects near the Clock Tower to a 24-inch sewer, located just west of Cowley Hall that runs north to south along the pedestrian mall. A manhole exists near the northwest wing of Cowley Hall and survey information indicates another building service may discharge to this structure from Cowley Hall. A new 6-inch sanitary service will discharge to the 10-inch sanitary main south of the building to serve the Phase 2 addition. The capacity of the 10-inch sewer is expected to be sufficient with the net change in load. The City has indicated that the downstream 24-inch sewer should have sufficient capacity since the only facilities served by the main are the University properties to the north.

3.2.4 Chilled Water Capacity

Refer to Section 6.6.6 for detailed description of chilled water service.

3.2.5 High Pressure Steam Capacity

Refer to Section 6.6.7 for detailed description of high pressure steam service.

3.2.6 Electrical Capacity

Refer to Section 6.7.4 for detailed description of electrical services.

3.3 Transportation/Circulation

3.3.1 Bus Access

Two bus routes serve campus with one route passing directly by the site on East Ave. The bus system is moderately used though more so during the colder months. No bus shelter exists on East Ave. and the existing site does not generate high ridership. However, with the new Student Center in full operation and the new Science Lab increasing teaching space, pedestrian traffic flow to this region of campus and the site will dramatically increase from existing. Appropriate accommodations should be considered during the design development of the Phase II Science Lab project factoring in effects of the new Student Center.

Vehicular traffic comes in two forms: service vehicles and general civilian traffic. Current service for Cowley Hall is at the east end of the building with primary access via the existing parking lot. Future service will need to accommodate room for 4 dumpsters (2 trash, 1 recycle, 1 cardboard) with room to maneuver and parking for at least 3 service vehicles as well as 3-4 accessible stalls. In addition parking and loading (small straight body trucks) for lab equipment should be accommodated, likely 2-3 stalls or a general designated loading area. The current parking lot will be removed and no new onsite parking is planned. Campus is currently embarking on expanding the new parking structure discussed in the project location section of this report. This parking structure will offset the loss of parking resulting from the Science Lab and new Student Center projects. An adjacent visitor lot is located across East Ave. at the Stadium but most users of the new building are anticipated to be approaching by bicycle, moped or by foot.

3.3.2 Bicycle & Moped

The Campus Master Plan identifies the academic core of campus as a bike and moped free zone. Bicycles are allowed through the academic core but should be walked through and not ridden. Major bicycle routes are intended to be via Badger, Pine (east of the project site) and East Avenue. To encourage and strengthen the academic core pedestrian nature provisions for bicycle and moped parking should be designed on building edges and sides that do not directly front the Central Campus Mall area. These areas should be concentrated where highest traffic counts are anticipated. These areas are likely to include the northeast and northwest project site corners off Badger St., the building frontages on Badger and East, and the southeast building corner. The intent is to encourage bicycle and moped riders to use vehicular based routes for conveyance and then collect them in logical locations and transition to pedestrian transportation.

3.3.3 Pedestrian Access

The UWL Campus remains largely a pedestrian oriented campus in parallel with a principle of the Master Plan to create a more walkable campus environment. The infill on this site in conjunction with the new Student Center will greatly increase the pedestrian presence in this region of campus. In addition, the concentration of civilian parking at the parking structure north of the academic core and project site will strengthen the pedestrian orientation of Campus. The connections created by these new projects will further strengthen the pedestrian activity on Badger Street and should encourage the development of this pedestrian corridor. All walks should be designed to the minimums as defined in the Campus Master Plan but should be evaluated based on anticipated traffic volume, especially in light of upcoming Campus changes stated.

4.1 Environmental Impact

In accordance with the Wisconsin Environmental Policy Act (WEPA), this project will require an Environmental Impact Statement (EIS). This requirement ensures that all fiscal impacts raised during the WEPA process will be addressed in the project budget estimate. The entire WEPA process must be completed prior to bid solicitation.

Signed into law in 1972, WEPA spells out the state's environmental policy and requires state agencies to consider the environmental effects of their actions to the extent possible under their other statutory authorities. It also establishes the principle that broad citizen participation should be part of environmental decision-making. WEPA imposes procedural and analytical responsibilities on the agencies but does not provide authority to protect the environment.

DFDM will contract an independent consultant to lead the EIS process. There is schedule of delivery of the EIS at this time.

4.2 Accessibility Requirements

An important goal for Phase 2 of the Science Labs Building is to continue to provide an accessible environment for all users as was started in Phase 1. The building will comply with applicable state and federal codes, DFDM Accessibility Guidelines, and other applicable standards for accessibility. The design team is encouraging a holistic approach to seamlessly integrate architectural solutions that address accessibility with dignity to the widest range of users. There are seven governing principles that enable this process as defined by *The Center for Universal Design*;

1. *Equitable:* Make design appealing and provide the same means of use for all users.
2. *Flexibility:* Accommodate a wide range of individual preferences.
3. *Simplicity:* Use of design is easy to understand.
4. *Perceptible Information:* Communicate necessary information to the user.
5. *Tolerance for Error:* Provide safe features throughout.
6. *Effortless Use:* Allow users to maintain neutral body positions and perform tasks with reasonable force.
7. *Size/Space for Approach and Use:* Provide space for approach, reach, and use regardless of users abilities.

Universal Design comes from incorporating these guideline principles into underlying design thinking. There are no specific goals to reach; there is instead a framework for creating resourceful solutions.

Due to the topography challenges of the site, accessible entrances are being provided by means of sloping sidewalks. Classroom tiering will be made accessible to all users through the use of ramps. Two elevators provided in this phase along with the two currently located in Phase 1, will provide all users universal opportunity.

4.3 Sustainable Facilities and Energy Conservation

The design will incorporate sustainable design principles to create a high-performance project with low operating costs, healthful indoor environments, low environmental impact, and long term durability. These environmental goals will be integrated into the design strategies for form, function, schedule, and budget. The design team is following the DFDM Sustainable Facilities Standards 2.0.

During the design process for the phase 1 of the new science building a green charrette was held where the design team interacted with stakeholders from the state, system, and university. Credits will be pursued that are required by DFDM Sustainable Facilities Standards that add long term value to the campus while meeting the capital budget. A preliminary DFD Sustainable Facilities Standards 2.0 scorecard was not completed for this 10% report; however, the intent is for the same strategies to be pursued as the phase 1 project. The following analysis is based on DFDM Sustainable Facilities Standards 2.0.

There are fourteen Sustainable Site Requirements credits. Currently the design team is anticipating achieving eight site credits and are studying two further for possible compliance. SS CW1/P1, C1, C2, C5.2, C6.1, C6.2, C7.1, and C8 are all possible to achieve. C4.4, and C5.1 are still being studied for compliance. SS C4.4 Alternative Transportation Parking Capacity seems likely as only 2 service parking spaces are designed to be located on site. SS C5.1 seems unlikely to achieve as it would require 50% of the non-building site to be native species and the current design is not meeting this criteria. SS C3, C4.1, C4.2, C4.3 are not achievable because the project site is not a brownfield; the local bus line stops are too far from the building entry to qualify; the existing showers on campus are not located close enough to our project; and, providing parking for low emitting and fuel efficient vehicles did not fit with the core mission of the facility.

The Water Efficiency Requirements have to two credits. Credit WE C1.2 Water Efficient Landscaping is able to be achieved due to the campus's policy of not allowing irrigation on campus. Under credit WE C3.1, Water Use Reduction the design team is tracking the potential for a 30% water use reduction which is above the target credit of 20%. The design team is investigating a 40% reduction in water use without adding capital cost and will be balanced with meeting DFD fixture standards.

There are seven Energy and Atmosphere Requirements. Four of the seven will be achieved. The building will be commissioned, meet minimum energy performance, CFC reduction in HVAC&R equipment, and optimized energy performance. The design team studied the potential for renewable energy and found it not to be cost effective for this project. The design team has been instructed to not pursue EA C5 Measurement and Verification, nor Green Power, so these are not being targeted.

The design team is currently tracking five of nine credits for the Materials & Resources category. Recyclables materials will be collected to be recycled. A construction waste management plan will be implemented during construction. The design team will specify high recycled content materials for materials that make up a large portion of the building, such as steel, gypsum board, and ceiling tiles. Local materials will be specified whenever possible, such as clay masonry, and concrete masonry. The design team will follow the DFS durable building standards. Building reuse, resource reuse will not be achieved as there is not a building to reuse as part of this project and no suitable materials to reuse. Rapidly renewable materials and certified wood credits are not being pursued.

There are ten Indoor Environmental Quality credits and the design team is targeting nine of them. The two main focuses will be indoor air quality management plans, and controlling pollution sources by specifying low-emitting materials. The daylight and view credit will not be pursued due to the deep floor plate required

to provide programmatic adjacencies; however, the design team is still trying to provide daylight to as many spaces as possible.

The operation & maintenance requirements; purchasing of furniture, fixtures, & equipment requirements; accountability, verification, & reporting requirements will all be achieved.

Applicable?	Requirements		Primary Responsibility	Remarks Note any: Reason if Unknown or Not Applicable, Any goals beyond Min. Req'ts., Other comments
	1. Portfolio Management & Assessment of Need			
Yes		** Portfolio Management & Assessment of Need	A	
	2. Program Development			
Yes		** Program Development	A	
	3. Integrated Design			
Yes		** Integrated Design	D, DSF	
	4. Sustainable Site Requirements			
Yes	SS W1/P1	* Construction Site Erosion & Sedimentation Control	D/C	
Yes	SS C1	Site Selection	A	Not prime farmland, or wetland
Yes	SS C2	Development Density & Community Connectivity	A	
No	SS C3	Brownfield Redevelopment	A	
No	SS C4.1	Alternative Transportation Public Transportation Access	A	
No	SS C4.2	* Alternative Transportation Bicycle Storage & Changing Rooms	D	
No	SS C4.3	* Alternative Transportation Low Emitting & Fuel Efficient Vehicles	D	
Yes	SS C4.4	Alternative Transportation Parking Capacity	A	
No	SS C5.1	Site Development, Protect or Restore Habitat	A/D	
Yes	SS C5.2	Reduced Site Disturbance Development Footprint	A/D	
Yes	SS C6.1	Permanent Stormwater Management (Discharge Rate & Vol - DNR 151)	D	
Yes	SS C6.2	* Permanent Stormwater Management (Quality Treatment - DNR 151)	D	
Yes	SS C7.1	Heat Island Effect: Non-Roof	D	
	SS C7.2	*LEED Credit Not Used*		
Yes	SS C8	Light Pollution Reduction	D	
	5. Water Efficiency Requirements			
	WE C1.1	*Incorporated into WE C1.2*		
Yes	WE C1.2	Water Efficient Landscaping No Potable Use or No Irrigation	D	
	WE C2	*LEED Credit Not Used*		
Yes	WE C3.1	Water Use Reduction, 20% Reduction	D	Utility low flow fixtures and sensor faucets - 30% target
	WE C3.2	*LEED Credit Not Used*		
	6. Energy & Atmosphere Requirements			
Yes	EA P1	* Commissioning	D, C	Indicate DSF Level 1 or Level 2
Yes	EA P2	Minimum Energy Performance	D	Required
Yes	EA P3	* CFC Reduction in HVAC&R Equipment	D	Required
Yes	EA C1	* Optimize Energy Performance for Projects > $2 million	D	Verify points to be targeted
No	EA C2	* Renewable Energy	D	
	EA C3	*Incorporated into EA P1*		
	EA C4	*LEED Credit Not Used*		
Yes	EA C5	* Measurement & Verification	D, O	DFS standard
Yes	EA C6	Green Power	A, O	DFS standard

oject No.13B3H- UW-La Crosse Science Labs Building - Phase 2				*43090*
Applicable?	Requirements		Primary Responsibility	Remarks Note any: Reason if Unknown or Not Applicable, Any goals beyond Min. Req'ts., Other comments
	7. Materials & Resources Requirements			
Yes	MR P1	**Storage & Collection of Recyclables**	D	**Required**
No	MR C1.1	**Building Reuse**	A	**Phase I site boundary comprises a parking lot**
	MR C1.2	*Incorporated into MR C1.1*		
	MR C1.3	*LEED Credit Not Used*		
Yes	MR C2.1	**Construction Waste Management**	C	**DFS standard**
	MR C2.2	*Incorporated into MR C2.1*		
No	MR C3.1	**Resource Reuse**	D	
	MR C3.2	*Incorporated into MR C3.1*		
Yes	MR C4.1	**Recycled Content**	D	
	MR C4.2	*Incorporated into MR C4.1*		
Yes	MR C5.1	**Local/Regional Materials**	D	
	MR C5.2	*LEED Credit Not Used*		
No	MR C6	**Rapidly Renewable Materials**	D	
No	MR C7	*** Certified Wood**	D	
?	MR W1	**** Durable Buildings**	D	
	8. Indoor Environmental Quality Requirements			
Yes	EQ P1	**Minimum IAQ Performance**	D	
Yes	EQ P2	*** Environmental Tobacco Smoke** (ETS) **Control**	O	**Required, but also a tobacco free campus policy**
	EQ C1	*LEED Credit Not Used*		
	EQ C2	*LEED Credit Not Used*		
Yes	EQ C3.1	**Construction IAQ Management Plan** During Construction	C	**Standard industry practice and specification**
Yes	EQ C3.2	**Construction IAQ Management Plan** Before Occupancy	C	**Not hard, unless schedule will not allow**
Yes	EQ C4.1	**Low-Emitting Materials** Adhesives & Sealants	D	**Specify**
Yes	EQ C4.2	**Low-Emitting Materials** Paints	D	**Specify**
Yes	EQ C4.3	**Low-Emitting Materials** Carpet	D	**Specify**
Yes	EQ C4.4	**Low-Emitting Materials** Composite Wood	D	**Specify**
Yes	EQ C5	**Indoor Chemical & Pollutant Source Control**	D	**Self closing doors and negative pressure labs, copy rooms, ETC and provide walk off mats.**
	EQ C6.1	*LEED Credit Not Used*		
	EQ C6.2	*LEED Credit Not Used*		
	EQ C7.1	*LEED Credit Not Used*		
	EQ C7.2	*LEED Credit Not Used*		
No	EQ C8.1	*** Daylight & Views**	D	
	EQ C8.2	*LEED Credit Not Used*		
	9. Operation & Maintenance Requirements			
Yes		**** Operation & Maintenance**	O	
	10. Purchasing of Furniture, Fixtures and Equipment Requirements			
Yes		**** Purchasing of Furniture, Fixtures and Equipment**	A	
	11. Accountability, Verification, and Reporting Requirements			
Yes	AR 1	**** Accountability for Sustainability**	DSF	**Occupant comfort surveys a requirement of AR 1 and supports pursuit of EQ C7.1 & 7.2**
Yes	AR 2	**** Verification during Project Design**	DSF	
Yes	AR 3	**** Verification during Project Construction**	DSF	
Yes	AR 4	**** Verification following Construction**	DSF	
Yes	AR 5	**** Reporting on Construction Results**	DSF	
	LEED Goals			
No		**Seeking LEED Certification**	A	
Yes	**LEED EB** (Agency Operations Equal to LEED Existing Building)		A	

4.3.1 Division of Facilities Development

The Division of Facilities Development and Management (DFDM) is committed to sustainable design to promote the environmental and economic benefits of energy conservation in the planning, design, construction, and operation of state facilities. DFDM has implemented policies to reduce energy consumption in state facilities without adversely affecting program operations.

All projects are required to meet the *DFDM Sustainable Facilities Standards*.

Recognizing that the greatest cost of owning state facilities over their lifetime is the cost of energy to heat, cool, light, and operate them, DFDM expects the design of every project to:

- Achieve the highest energy efficiency and lowest energy consumption that life-cycle costing will justify;
- Incorporate the most energy-efficient materials, products, equipment, and systems consistent with program and budget;
- Incorporate renewable energy technologies at the earliest possible stages of design whenever they are technically and economically feasible;
- Consider the impact on the utility infrastructure of the existing facility.
- Select environmentally responsible materials and products with reduced maintenance required.

4.3.2 Integrated Design Process

DFDM expects the A/E to follow an "integrated design approach" on every project. The architectural, mechanical, and electrical systems are being designed as parts of a whole building/energy system. The architectural form (orientation, massing, treatment of façade, fenestration, interior surfaces and lighting) takes into consideration the impact to the building's energy use. The site lends itself to ideal building orientation, with the building's length along an E-W axis. Sun control was integrated into the west and south walls of Phase 1 and will be considered again for use in Phase 2. The extent of fenestration is limited on the building's East and West elevations. The design does incorporate daylighting strategies by providing carefully sized windows and interior layouts to support daylight and views in most regularly occupied spaces; thus, minimizing reliance on artificial lighting.

4.3.3 Building Energy Modeling

This project is a new building. Per chapter four of the DFD Policy and Procedure Manual, energy modeling is required for all new buildings to demonstrate that building energy cost is 10% less than a SPS 363 / 2009 IECC code designed building.

Some of the energy conservation strategies being studied include:

- Envelope insulation improvements
- Daylighting
- Energy efficient glazing systems
- Energy recovery systems
- Demand controlled ventilation in the offices spaces (DCV will be required by in large, high density spaces)
- Occupancy control of HVAC systems
- Occupancy control of many lighting systems
- Daylighting control for some lighting systems
- Reduced lighting power densities
- Heat recovery chiller system
- High Efficiency Energy Recovery system

4.3.4 Renewable Energy Sources:

Projects with a total budget exceeding $500,000 are expected to make maximum practical use of active solar heating and renewable electric generation from solar thermal or photovoltaic systems, wind power, geothermal technology, biomass, fuel cells using renewable fuel or tidal or wave action and small hydro, *when technically and economically feasible*. This project evaluated the feasibility of both solar domestic hot water heating, a hybrid ground-source heat pump hybrid system, photovoltaics, and wind turbines. The evaluation determined these approaches are not cost feasible for this project at this time.

4.3.5 Recycled Materials:

Recycled materials will be used throughout the building renovation. Recycled steel will be used in the penthouse roof framing systems, reinforcing bars, stair assemblies, and miscellaneous framing. The phase 1 project specified the following and the same materials should be used in the addition. Acoustical ceiling tile should have 70% recycled content. Millwork and casework will use urea-formaldehyde-free MDF board – with a 100% recycled content. Gypsum wall board will also as high a percent of recycled content as possible. By targeting the most prevalent materials used in the renovation: structure, wallboards, flooring, casework, ceilings – the material selection has maximized the recycled content within the design.

4.3.6 Regional Materials:

Regional materials to be specified for this project include concrete, clay brick, concrete masonry, structural steel, and precast trim. These materials will be specified to manufactured or fabricated within 500 miles of the site.

4.3.7 Division of Facilities Development & Management Sustainable Facilities Standards

The Division of Facilities Development Sustainable Facilities Standards prescribe the minimum sustainable requirements for state construction and leased facilities and they apply to all DFDM projects without exception, regardless of size or budget. The fundamental purpose is to improve the overall quality and usability of State owned and leased facilities to optimize monetary, environmental and human resources.

4.4 Commissioning

As outlined in the DFDM AE and Consultant Policy and Procedure Manual, commissioning practices are to be implemented into all procedures and documentation used in the planning, design, construction, closeout, and operations of this building. Provide for verification through the commissioning process that building systems are designed, installed, and perform according to DFDM's project requirements, basis of design, and construction documents. The following guidelines are to be followed:

- Implement the fundamental best practice commissioning procedures as outlined in the DFDM AE and Consultant Policy and Procedure Manual.
- Commissioning procedures will be referenced in the Design Report.
- Provide a final commissioning report, signed by the commissioning provider, confirming that the fundamental commissioning requirements have been successfully executed.
- Specific commissioning submittal and documentation requirements are to be identified in the commissioning provider's contract and in the project bid documents.
- Engage a commissioning authority and adopt a commissioning plan.
- Task the commissioning provider to produce a final commissioning report once all outstanding commissioning activities are completed and all identified issues are resolved successfully.

DFDM will select a third-party commissioning agent for this project during design.

4.5 Hazardous Substances

While Phase 1 of the New Science Labs Building project had no demolition or abatement, Phase 2 will be challenged by both issues. The presence and location of hazardous materials is inventoried in the State's database titled Wisconsin Asbestos and Lead Management System (WALMS). In general, asbestos-containing materials that will require abatement prior to demolition of Cowley Hall will be addressed as part of this project. DFDM will commission a consultant outside of the Design Team for hazardous material consulting.

4.6 Equipment

4.6.1 Movable and Fixed Equipment

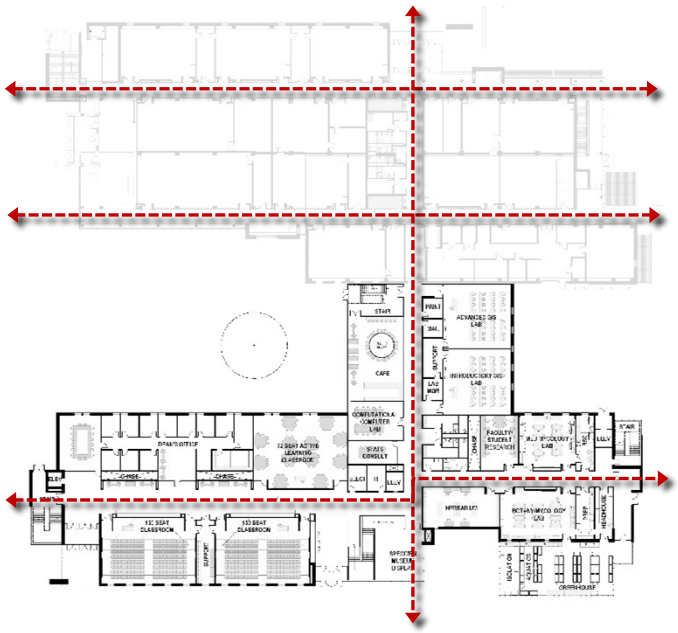
- Classroom, instructional lab, and research lab movable furnishings will be provided by the University. Fixed seating will be provided and installed by the contractor.
- Communications equipment will be provided by the University.
- One wall-mounted clock/transmitter (wireless master-clock system) facing the podium will be provided for each classroom.
- Teaching podiums will be provided in each classroom.
- Marker boards will be provided in all classrooms. Marker boards should include a tack strip at the top edge. Marker boards will be installed at a height as required in the DFDM Accessibility Guidelines.
- Refuse containers will be provided by the University in all classrooms, laboratories, workrooms, corridors, lobbies, resource areas, etc.
- The lobby will be provided with a signage directory and an area for donor recognition plaques.
- Complete definition of all significant equipment needed in the building should be developed in the design phase to include:
    - the standards to be followed,
    - the utility services required,
    - the purchaser of the item,
    - the installer of the item, and
    - the budget that the associated costs will be charged against.

5.1 Overview

The Science Labs Building project is a 356,840 square foot science education facility that will be delivered in two phases. Phase 1 is currently under construction and includes 192,585 square feet of primarily instructional and research laboratories. This report focuses on the remaining 164,255 square feet of Phase 2 which will complete the overall vision.

The strategic planning decision to put almost all of the instructional and research laboratories in Phase 1 created an organizational challenge in Phase 2 to successfully connect the rest of the specialty labs, classrooms, and faculty offices to create a unified science learning environment. The goal was not to let the phased implementation delivery of the program elements compromise the functional and aesthetic experience of the overall complex.

The organizing diagram that emerged in the 2011 Pre-Design Study, and was validated in the 2014 Phase 1 design development process, was the H-shape plan. The long bars of the "H" provide spatial opportunity to deliver the robust program requirement of each phase in a bar and then the short connecting bar links the composition into a unified composition. The Phase 2 work provides the southern bar and the connecting link to Phase 1 to complete the "H". This configuration maximizes access to natural light and creates two distinct courtyards that alleviate the potential massiveness of a 350,000 square foot building. The western courtyard opens to the main campus mall and is suited for socialization, and the eastern courtyard faces East Avenue and is positioned favorably for vehicular service use.



5.2 Design Guidelines and Assumptions

Three documents that guided the design team; the Campus Architectural Design Guidelines in the 2005 Campus Master Plan, the updated Design Guidelines/Assumptions from the 2011 Pre-Design Study, and the Goals for the Cowley Hall/Science Building Project developed by the College of Science and Health in 2014. These documents are outlined as follows:

5.2.1 Campus Architectural Design Guidelines

Character: New building should possess similar to key campus structures and be perceived as a unified group

Scale: Location, height (5 story max.), massing

Form: Traditional style with science/technology attitude

Shape: Rectangular with respect to the orthogonal grid of the campus
Layer to establish base, middle, and top

Walls: Natural: wire-cut, reddish-brown brick
Openings: punched (traditional) versus massed (curtain wall)
Pattern: surface articulation and pronounced natural layering
Rhythm: discernable, repetitive pattern

Roof: Flat
Screen roof top projections

Entrances: Distinctive and welcoming
Portal sets up interior "tone"
Protected cover
Signage
Barrier free accessible

5.2.2 Design Guidelines/Assumptions

Phase 1 and 2 should link seamlessly with no evidence of phased implementation delivery.

Formal main entrances near Clock Tower at southwest corner and at south-central off campus main walk.

Position vertical circulation near entry points.

5 level design scheme to align with Phase 1.

Simplify wayfinding layout for interior halls.

Maintain modular laboratory 10'-6" grid for functional efficiency, accessibility, and future flexibility.

Incorporate DFDM Sustainability Standards

- Maximize natural (especially north and south) light into all habitable rooms and spaces with appropriate sun-control strategies.
- Integrate comprehensive environmental strategies seamlessly into the facility for energy conservation.

Exterior design follows UW-L Campus Master Plan Architectural Guidelines.

5.2.3 Goals for the Cowley Hall/Science Building Project

UW-La Crosse science and mathematics faculty are committed to offering educational experiences that are

- Inquiry-based
- Collaborative
- Integrative and serve societal goals.

The new facility should be a signature academic building, capably housing programs in biology, chemistry, geography and earth science, mathematics, microbiology, and physics, that supports

- Investigative Science and Mathematics Programs
- Teaching Scholars
- Innovative Science and Mathematics Pedagogy
- Student/Faculty Interaction
- Faculty Collaboration
- Interdepartmental/Interdisciplinary Studies
- Faculty Research
- Student Research
- Science Mathematics on Display

5.3 Site Concept

5.3.1 Overview and Approach

Phase 2 of the site project follows the same parameters established by Phase 1. Honor setbacks along East Avenue in line with the new Student Center north or the project site. Honor a setback along the west side of the building as established by Wittich to the south and the Student Center to the north. Honor an open space concept around the central clock tower and provide open space for the north half of a future central pedestrian mall west of the building. The site planning takes these parameters and overlays cues from anticipated pedestrian circulation movements, universal access to the building, creating a central plaza between phases 1 and 2, and providing a service court with screening.

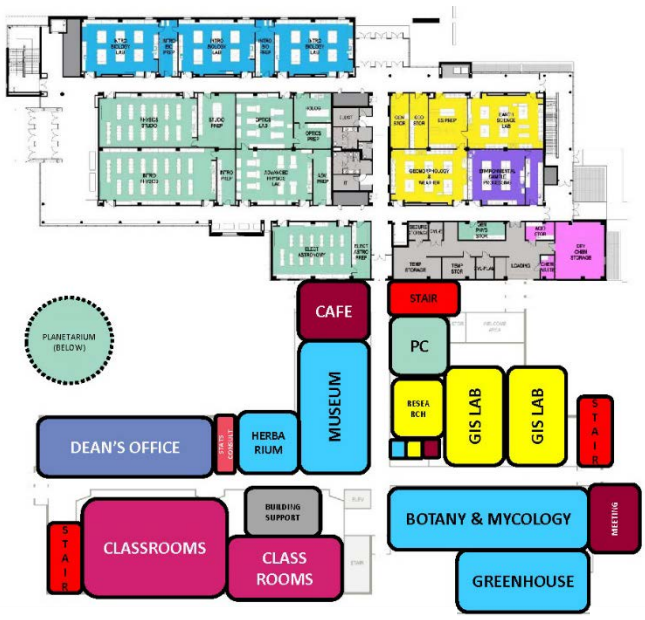
The description of the preliminary site plan begins at the northeast corner and continues clockwise around building. Continuing the design from Phase 1, the service area is maintained providing access for waste removal, service deliveries, limited service and ADA parking. A screen fence or wall will provide a buffer between the open paved area and East Avenue with landscaping in between.

The International plaza southeast of the site is maintained but the primary east-west sidewalk is straightened to help the site feel less constrained. Arching sidewalks at the south-central and southwest entries provide universal access to the main building entry points for the Phase 2 building. The south central walk maintains less than 5% grade while the walks from the clock tower and the primary walk to the south will be 8% grade and will require handrails. Landscaping along the south face of the building will be low so as to allow daylighting for classrooms in the lower level of the building. Grade differences between the building entries and the primary south sidewalk are approximately 4' at the south central, and 6' at the southwest. The west site is kept open keeping in line with the master plan to provide greater open green space as part of the overall central mall concept.

A courtyard is created between the Phase 1 and Phase 2 buildings. This courtyard is intended to provide the building with a unique space of its own similar to the south courtyard of Centennial Hall. The courtyard is designed to implement stormwater infiltration via rain gardens and depressed planters while providing selective pavement shading and ground interest through plantings. The plaza expands near the interior café space of the Phase 2 buildings.

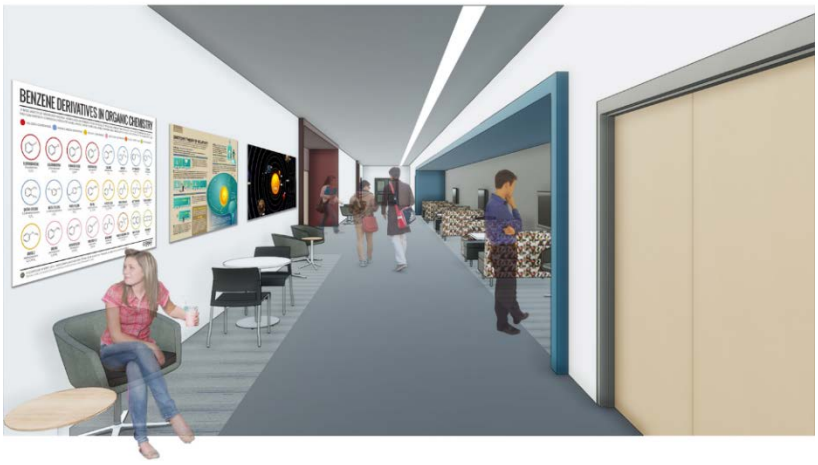
Due to the limitations of the well head protection zone discussed in the stormwater section of this report, additional areas west and south of the building may be required to achieve the targeted 50 year rain events. The three triangular areas created by the sidewalks southwest of the Phase 2 development may be utilized for this purpose.

5.4 Floor Plans



The overall floor plan shape was strategically established in the Pre-Design process. The H-shape plan was divided into Phase 1 and 2 components to deliver the program elements. The Phase 1 rectangular bar was positioned on the open northern half of the site, and the connecting bar and link for Phase 2 on the southern half of the site where Cowley Hall now sits which would complete the H-shape. The H outline was delineated with input in the collaborative program verification process. The primary program components in Phase 2 are the College of Science and Health – Dean's Office, instructional classrooms, specialty laboratories for the various departments, departmental faculty offices and collaborative spaces to support student life and public outreach. The critical adjacencies of these rooms were identified early in the program verification process by floor and department to align key associations for functional efficiency. For example, the faculty offices were distributed to their interdisciplinary themed counterparts and in close proximity to their research laboratories whenever possible. The large capacity instructional classrooms were deliberately positioned on the floors at grade to minimize taxing of the vertical circulation routes at class changes. These adjacencies, room groupings, and level assignments were tested early and frequently in the conceptual bubble diagrams to validate Phase 1 design decisions and to influence Phase 2 planning. It was crucial to create ideal learning settings by level that were not compromised by the potential delay in achieving the Phase 2 work.

The primary objective is to create an overall plan layout that achieves the Phase 1 instructional and research requirements, and when the Phase 2 faculty offices, classrooms, and collaborative support areas are finally completed, the entire facility will be operating at maximum efficiency as if it was built at one time rather than in phases.



Level 1 Floor Plan

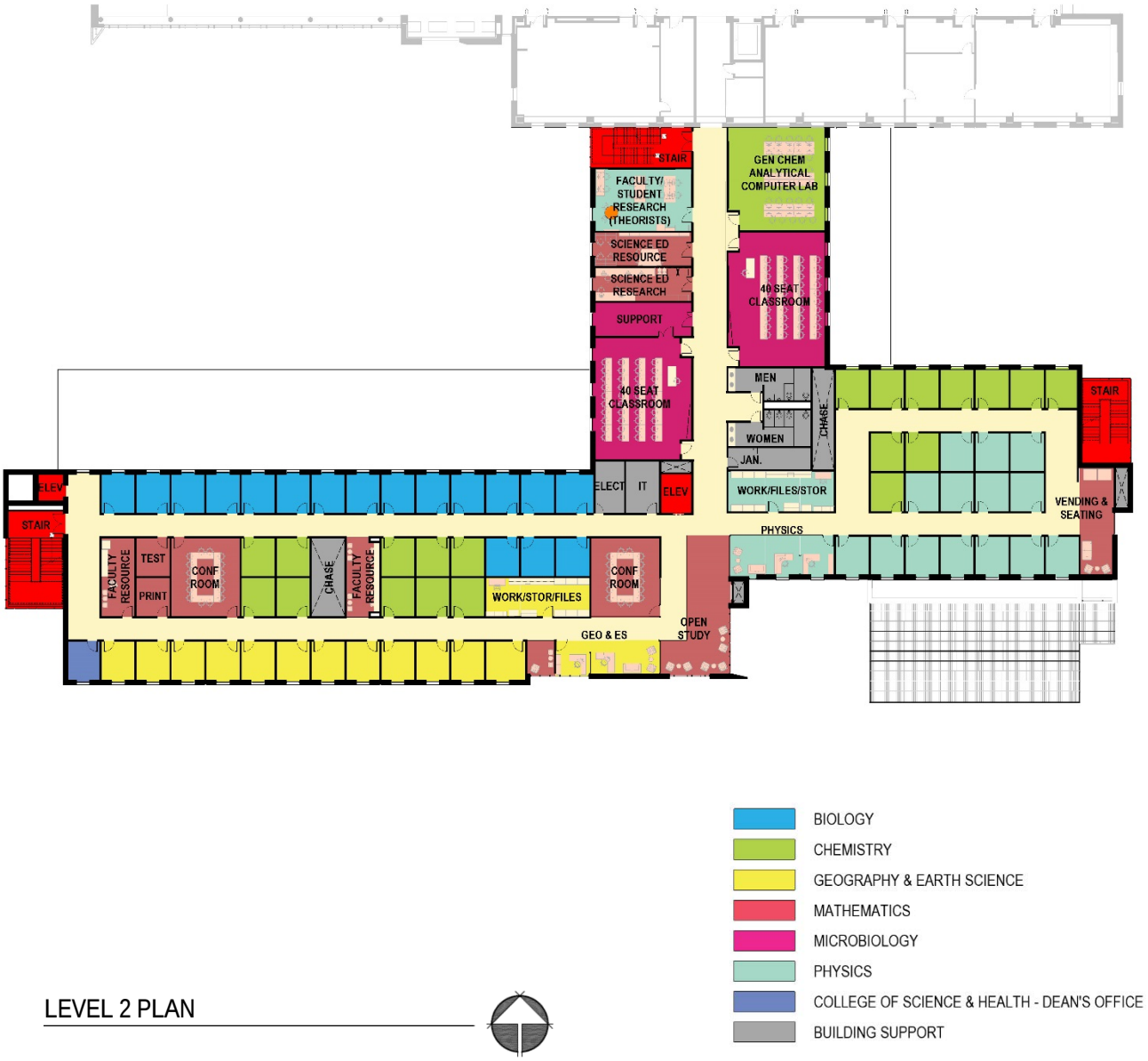
A number of key factors played into the arrangement of Level 1. Entrance locations were positioned to best serve the campus's high volume of student traffic from the south and southeast. The interior wayfinding is direct with a primary east-west hall that intersects the main north-south hall that connects Phase 1 and 2. The horizontal circulation system has natural light at its ends and conveniently accesses stairs and elevators. A grade-level greenhouse and adjacent lab space was requested by the campus to be located at the southeast corner of the building with the two GIS labs located near their corresponding labs of Phase 1. The College of Science and Health - Dean's Office is prominently positioned to provide the most visibility to students. Two 150-seat lecture halls are located near the two main entrances along with an active learning classroom and corridor collaboration opportunities. A cafe/collaboration area connects the two building phases and provides a centralized area for student and faculty interaction.

CLASSROOMS
MISC. INSTRUCTIONAL SUPPORT
BIOLOGY
CHEMISTRY
GEOGRAPHY & EARTH SCIENCE
MATHEMATICS
MICROBIOLOGY
PHYSICS
COLLEGE OF SCIENCE & HEALTH - DEAN'S OFFICE
BUILDING SUPPORT

LEVEL 1 PLAN

Level 2 Floor Plan

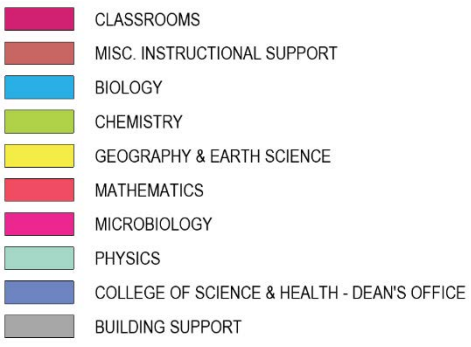
The organization of Level 2 started with locating the offices of Geography & Earth Science and Physics at this level to work in close proximity to their labs on Level 1 of Phase 1. Due to the limited number of offices contained within these two departments, Level 2 offers an opportunity for more interdisciplinary organization of offices among faculty that may share similar interests. The floor plan depicted shows additional Biology and Chemistry offices located on this floor as overflow from the floors above. Two 40-seat classrooms and adjacent prep room are located within the connecting link while various support spaces are distributed throughout the floor level. These include Faculty Resource, Conference Rooms, and an Open Study area.



LEVEL 2 PLAN

Level 3 Floor Plan

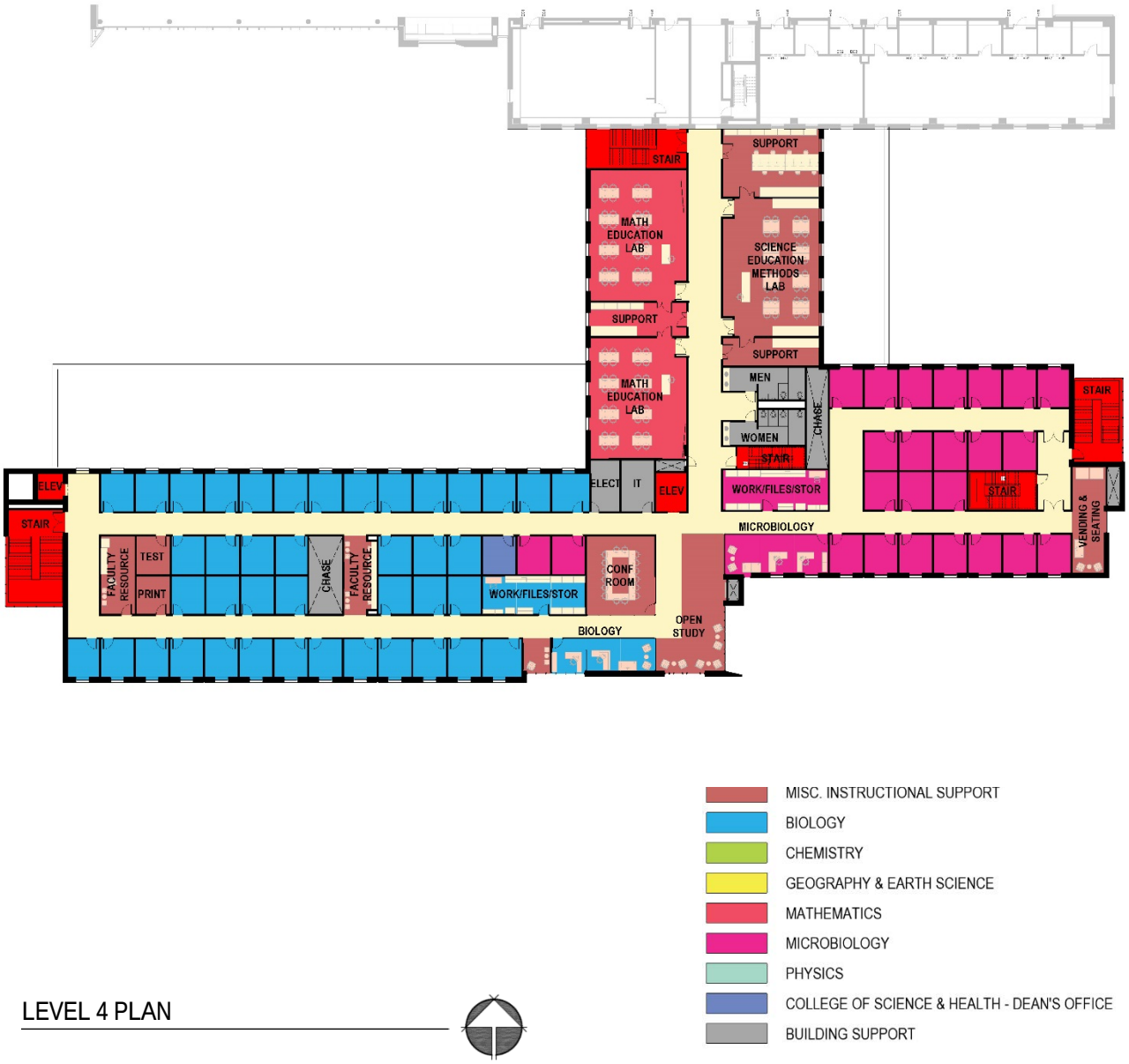
Level 3 contains the offices of Mathematics and Chemistry. A computational chemistry lab is located directly adjacent it's corresponding chemistry labs in Phase 1. Two 50-seat classrooms and adjacent prep room are located within the connecting link while various support spaces are distributed throughout the floor level. These include Faculty Resource, Conference Rooms, and an Open Study area.



LEVEL 3 PLAN

Level 4 Floor Plan

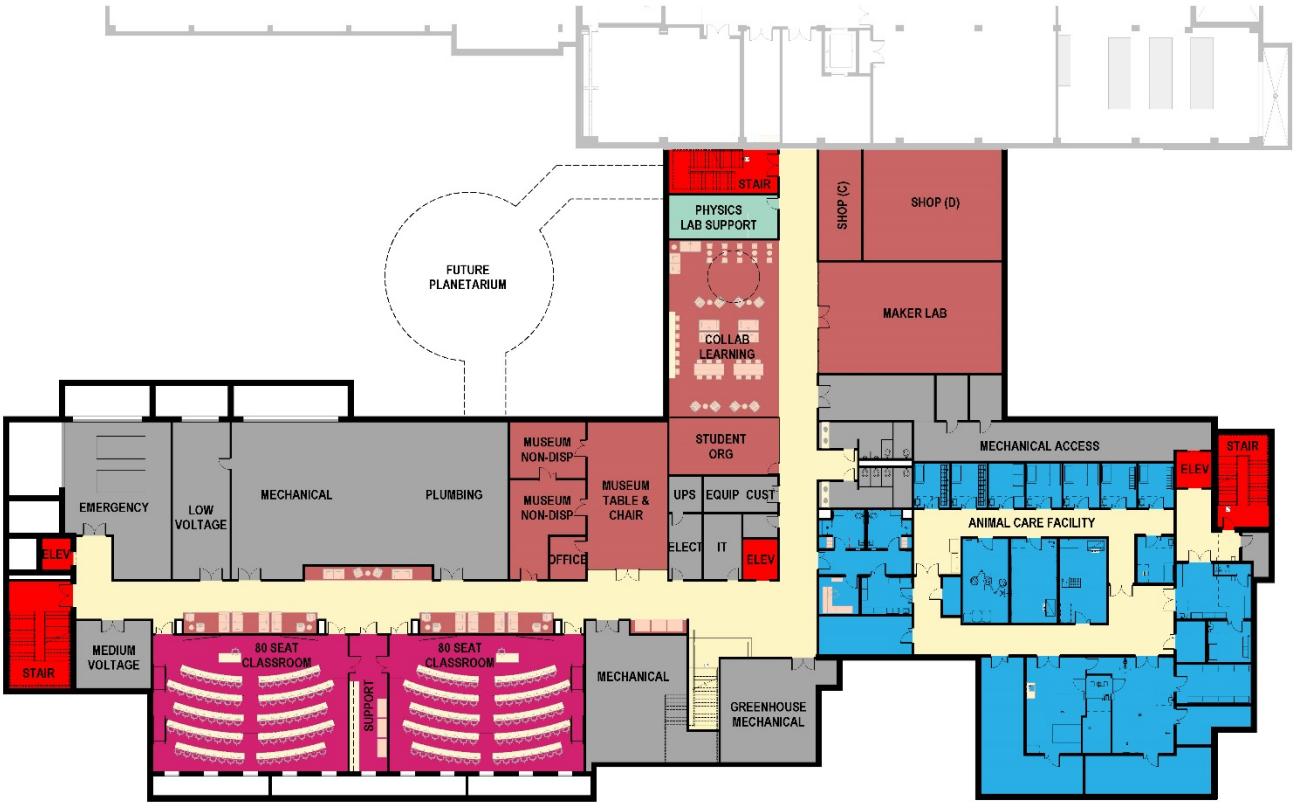
Level 4 contains the offices of Biology and Microbiology. Math Education and Science Education Methods have a requested adjacency with one another and work well within the connecting link. Miscellaneous support spaces include Faculty Resource, Conference Rooms, and an Open Study area.



LEVEL 4 PLAN

Level 0 Floor Plan

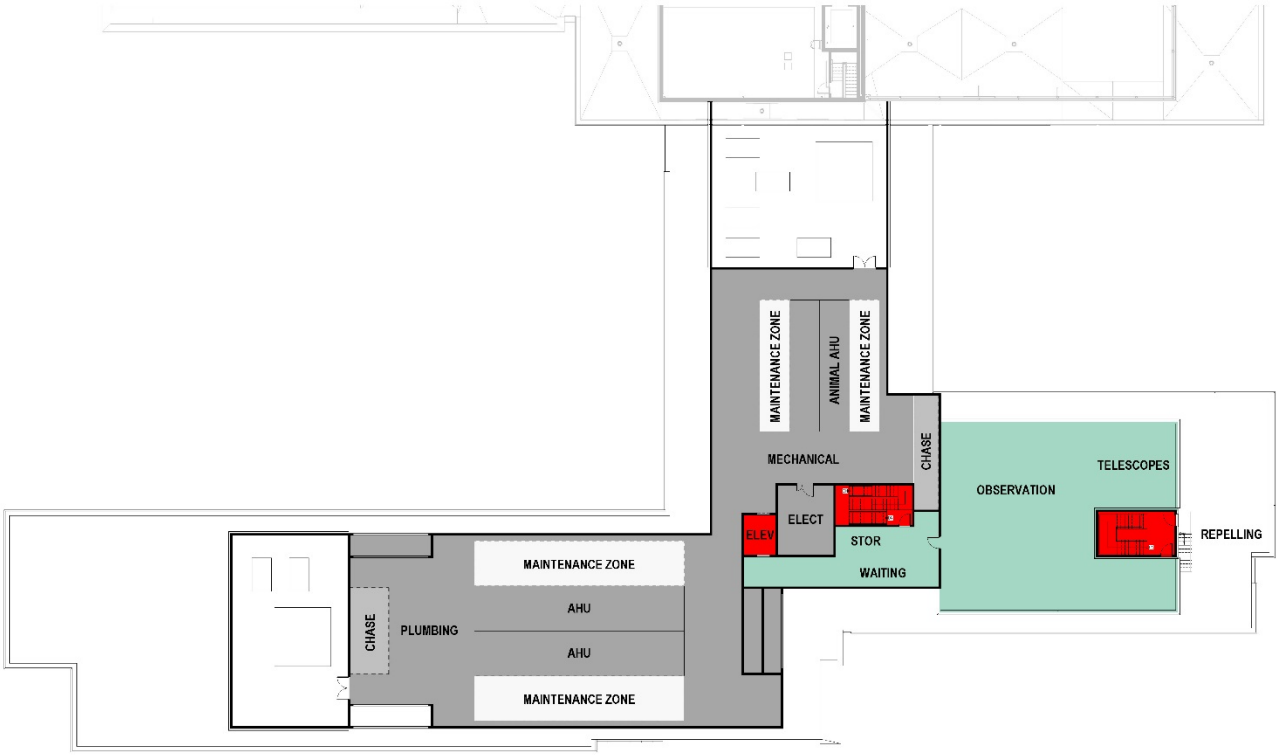
The organization of Level 0 was based on a number of key factors. A change in grade from east to west along the south facade provides an opportunity for natural light into occupied spaces and as a result, two 80-seat classrooms have been located in the southwest corner. Biology's animal care facility requires vibration and sound isolation and requires a direct connection to the service courtyard via a secured entrance and elevator. Shop space is strategically located within the connecting link as it will primarily serve the instructional and research activities included in Phase 1. Mechanical space is provided along the south side for connections to incoming utility services. Collaborative learning spaces and Specimen Museum are located adjacent the main corridors for optimal visibility and access. Planning exercises prior to the submittal of this report, illustrated the planetarium (dome, pre-function area, and support spaces) at this level located within the west courtyard area.

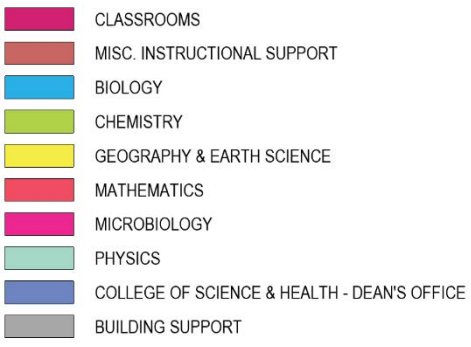


LEVEL 0 PLAN

Penthouse Plan

The roof of Phase 2, much like it's counterpart in Phase 1, is comprised of a mechanical penthouse, screened equipment areas, and an open roof condition. One key feature at this level of the building is the rooftop observation area. Viewing of the night sky will occur at an open observation platform along with a telescope viewing area. The telescope piers are to be isolated from vibrations and all viewing angles are to be screened from local light pollution at grade level. An elevator will serve both the penthouse and the observation area. Two egress stairs are required from the observation area. The mechanical systems have been carefully studied and organized to create the most efficient layout by sharing equipment zones whenever possible. Air handling units, energy recovery equipment, plumbing systems, and electrical equipment will be located at this level.





ROOF PLAN

5.5 Elevations

In keeping with the design methodology used in Phase 1, the building design evolved from the inside to the outside. The floor plan configuration emerged from that process with a design parti that intentionally influenced the exterior massing. The northeast corner contributes to the experience of a campus visitor and takes advantage of the views of the bluffs to the east, while the southwest corner offers vistas to the campus mall for the students. The design team feels the difference of the edge condition should be expressed on the exterior facades while still composing a unified building.

The Design Team worked through multiple iterations of the facades to find a contextual articulation that complies with the campus architectural guidelines and was previously established in Phase 1, while expressing the cutting-edge scientific character of the building. The exterior expression blends with the campus due to the use of red modular face brick, stone detailing, and punched windows.

Our response is to anchor the exterior design in the contextual roots of the traditional architecture with cues from neighboring Wittich Hall and Centennial Hall at the opposing southwest and northeast corners, which are designed to be clad in brick masonry and punched window openings. The size and placement of the windows in the masonry is in keeping with the lab planning module used in Phase 1 and continued in Phase 2 and balances the functionality of the interior with the interpretation of the collegiate gothic exterior context. The skillful balance of the massive masonry corners with the openness of the glazed curtain wall with cast stone trim of the opposing corners delivers a building that respects the past of the campus while expressing the future forward nature of the work taking place inside.

WEST ELEVATION

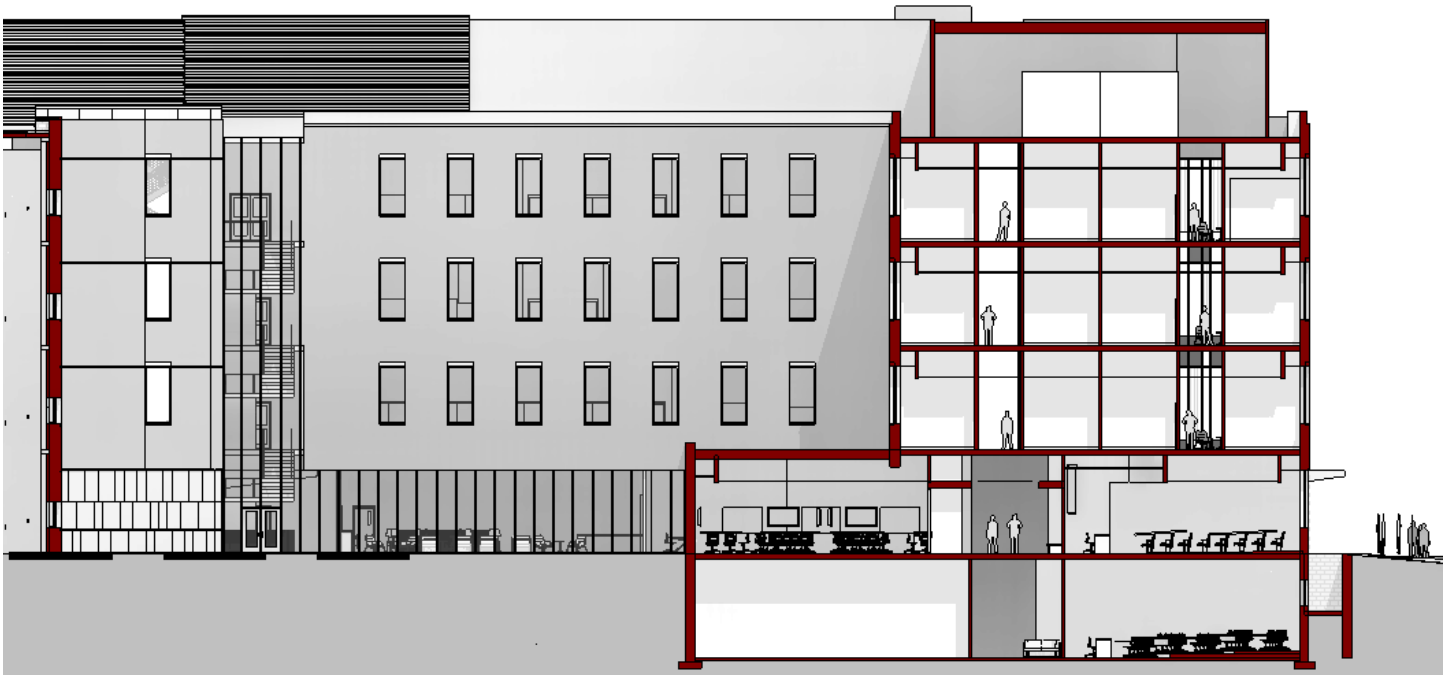
SOUTH ELEVATION

EAST ELEVATION

5.6 Building Section

The following North-South building section is cut at the widest portion of the building where the single-story massing extends north into the courtyard area. The section illustrates the building is four stories above grade with a full basement containing a mix of building support spaces and programmed area, and a penthouse consisting of exclusively building support (MEP) space.

The typical floor to floor height is 16'-0" with a dropped ceiling in most spaces in the 10'-0" to 11'-0" range. The exact height will be established with the engineers to make sure all the routing of services can take place in the interstitial space while maintaining simultaneous use of the markerboard and projection screen.



5.7 Renderings

6.1 Architectural Systems

6.1.1 Access/Circulation

The entry routes to Phase 2 of the Science Labs Building and the interior circulation system will be barrier-free accessible, functionally organized to promote efficient wayfinding, and distinctively designed. The primary building entrance(s) are strategically positioned to relate to the primary student routes. The site provides opportunities for multiple building entrances from different sides of the building. The entrance(s) will be protected from the elements and have vestibules. Two main entrances are being provided along the south and west ends of the building. The formal public entrance is located at the south-central portion of the building off the green space east of Wittich Hall.

A second main entrance off of the campus green (southwest) will open into a public lobby space that serves as a general reception, route-finding, donor recognition, and waiting area. Every resourceful way to economically distinguish this space (i.e., natural light, openness, materials, colors, etc.) is being considered. The horizontal and vertical circulation routing will originate from the lobby and distribute people to the programmed rooms of the building in a convenient, safe, and memorable way.

6.1.2 Image

The Science Labs Building is being constructed in a prominent, highly visible location on campus and will be treated as one that will be seen and experienced from multiple sides.

In keeping with the design strategy already implemented in Phase 1, Phase 2 of the Science Labs Building will respect the context of the overall campus physical organization and the context created by nearby Centennial Hall and the new Student Center. Phase 2 will quietly blend in with the existing context, in deference to existing iconic buildings and open spaces. Efforts were made in Phase 1 to adhere to the Architectural Guidelines that were outlined in the 2005 Campus Master Plan and that effort will continue for Phase 2.

The building will promote the prominence of a cutting-edge academic institution, yet still fit into the distinctive UW-La Crosse campus environment. Each of these characteristics will contribute individually and collectively to the overall image as follows:

6.1.6 Exterior Materials

Considering that the earliest buildings on the UW-La Crosse campus have been in use for nearly a century, the durability of materials is clearly a major material influence. The exterior palette of materials proposed in the concept design is brick and cast stone with a color, range, dimensions, and bond pattern similar to the brick used on Centennial Hall. Clear glass in anodized aluminum frames meeting the requirements of the DFDM daylighting standards will be used. Areas that don't require vision glazing will use a shadow-box spandrel glass. Other areas will use a translucent glass which will be achieved through a ceramic frit coating. Zinc is currently being proposed as an accent trim because of its rich grey color and natural patina and durability. Pre-finished champagne-colored metal panels will be used as a cladding material of the mechanical penthouse along with the equipment screen enclosures at the roof level.

6.1.7 Interior Partitions

Walls will typically be constructed of gypsum wall board on metal studs with a painted surface. The gypsum wall board will be dent and abrasion resistant at the lower 48" of the main corridors.

Custodial closet walls to have wall protection to 42" consisting of antimicrobial solid surface material.

Sound attenuation will be used wherever sound isolation is required. Refer to Section 6.1.13 for Acoustical Design Considerations for minimum Sound Transmission Class (STC) ratings.

Classrooms and laboratory walls will extend from top of slab to underside of structure and will be acoustically sealed at the top and bottom. Two layers of 5/8" gypsum board will be provided on each side of the classrooms, laboratory and corridor walls with insulation in the cavity. Gypsum board seams will be staggered and each layer taped and mudded individually.

Office walls will extend from top of slab to underside of structure and will be acoustically sealed at the top and bottom. A single layer of 5/8" gypsum board will be provided on each side of wall with insulation in the cavity. Gypsum board seams will be staggered and each layer taped and mudded individually.

Painted unit masonry may be used in spaces that require additional durability.

Low VOC paint with an egg shell finish will be used at all painted surfaces.

Epoxy paint to be provided at laboratory spaces requiring antimicrobial protection.

Corner guards will be provided at all exterior corner conditions.

6.1.8 Doors

Interior doors will be 1-3/4" thick solid core natural wood finish doors in aluminum frames, at least 3'-0" wide by 7'-0" high, or wider if required for egress by code or higher if required for equipment movement.

Vision panels and/or sidelights to corridors will typically be provided where feasible and specified at a height as required in the DFDM Accessibility Guidelines.

At code-required fire-rated locations, doors and frames should be fire-rated assemblies.

Door hardware will be code compliant, heavy-duty type, lever style, with mortise locksets. Locksets will be compatible with existing campus locks. All doors will be lockable with a "Classroom" function, i.e., egress is always possible without a key.

Specialty labs and office suites will include access control.

Entrance doors and frames will be anodized, thermally broken aluminum with insulated glass and will be A minimum of 3'-0" wide or wider if required for egress by code. All entrances will incorporate automatic operators and access control.

6.1.9 Windows

Windows will be maximized at exterior walls where appropriate while also minimizing direct sunlight and glare on work surfaces.

Windows at exterior walls will be provided with clutch-driven roller shades.

Interior windows will be incorporated where appropriate for "borrowed" natural light. A 3/8" frameless glass to be provided into enclosed rooms using a glazing track at the top and bottom.

Exterior windows will be anodized, thermally broken aluminum frames with high performance insulated glass.

6.1.10 Ceilings

Suspended grid tile ceilings will be provided where required for acoustics and cleanliness. Rooms without such requirements will have no ceilings and can remain open to the structure above. A 2x2 acoustic ceiling tile with metal edging will be used.

Corridor ceilings to be open to the structural and mechanical systems above and will incorporate metal, wood, or gypsum board clouds whenever possible.

Classrooms, offices, teaching labs and research labs will have 10'-0" minimum ceiling heights; other areas many have lower ceiling heights. (min. 7'-6" by code)

Pendant mounted light fixtures may be suspended below the 10'-0" ceiling. Careful consideration and study will be done by the A/E team to determine the appropriate ceiling height as it relates to window height and daylight penetration into the space. A/E will also consider projection screen height and usable marker board space as it relates to mechanical space above the ceiling. It is anticipated that 11'-0" to 12'-0" ceilings will be necessary at the front of classrooms and other spaces where simultaneous use of the whiteboard and projection screen is required.

Acoustic tiles will be used in most suspended grid ceilings. A wood slat ceiling with an NRC of .90 min. will be provided at the main lobby area.

Laboratory spaces equipped with suspended ceilings will have fiberglass ceiling tile for use in clean room applications.

6.1.11 Flooring

Vestibules and secondary arrival spaces will have modular walk-off carpet tile.

Office corridors to have carpet tile finish. The north-south connecting corridor and east-west corridor at level 1 to have stained concrete finish.

Classrooms and offices will have carpet flooring and base to align with campus standards.

Teaching and research laboratories will have sheet rubber flooring with 4" integral base. Rubber sheet flooring to be provided with heat welded seams and integral rubber base to be provided in various spaces.

Porcelain tile and base will be provided in restrooms. Elevators to include porcelain tile floor.

Stairs and landings to have terrazzo treads and risers. A stainless steel railing system with stainless steel handrail to be provided for the stair railings.

Epoxy resin flooring to be provided at the Shared Autoclave, River Studies, and Environmental Sample Processing rooms. Epoxy resin traffic coating to be provided at loading dock support spaces.

Sealed concrete will be provided in mechanical spaces with waterproofing membrane finish at the penthouse floor.

6.1.12 Casework

Casework not associated with teaching or research laboratories will be finished with plastic laminate.

Refer to section 6.2.3 for laboratory casework description.

6.1.13 Acoustical Design Considerations

The acoustical design for the University of Wisconsin Lacrosse Science Building will seek to maximize speech intelligibility in Labs, Lab Support spaces, Prep Spaces and the Core Microscope space and provide speech privacy for offices and eliminate noise build-up in public circulation spaces and mechanical rooms. Achieving acoustic design goals requires careful attention to room acoustics (finishes), sound isolation, and mechanical system noise and vibration control.

Acoustic standards

The acoustical design will be based on the following standards:

- ANSI/ASA S12.60-2002 American National Standard Acoustical Performance Criteria, Design Requirements, and Guidelines for Schools.
- Chapter 48 'Sound and Vibration Control' from the 2011 ASHRAE Applications Handbook.

Room Acoustics (Finishes)

The following acoustical finishes are anticipated:

- Classrooms
  - Ceiling: 0.90 NRC sound absorbing finish (E.G.: Acoustic Ceiling Tile, Acoustic Spray applied to the structural deck)
  - Walls: 2' tall band applied to 50% of wall surfaces having a NRC 0.9 rating
- Labs and Lab Support
  - Ceiling: 0.90 NRC sound absorbing finish (E.G.: Acoustic Ceiling Tile, Acoustic Spray applied to the structural deck)
  - Walls: 2' tall band applied to 50% of wall surfaces having a NRC 0.9 rating
- Offices/ Individual Workstations
  - Ceiling: 0.75 NRC sound absorbing finish (E.G.: Acoustic Ceiling Tile, Acoustic Spray applied to the structural deck)
- Prep
  - Ceiling: 0.90 NRC sound absorbing finish (E.G.: Acoustic Ceiling Tile, Acoustic Spray applied to the structural deck)
- Corridors and Circulation- Labs, Lab Support, Prep
  - Ceiling: 0.90 NRC sound absorbing finish (E.G.: Acoustic Ceiling Tile, Acoustic Spray applied to the structural deck)
- Mechanical Rooms and Elevator Machine Room
  - Ceiling: 0.90 NRC sound absorbing finish applied across 50% of the ceiling surface
  - Walls: 0.90 sound absorbing finish applied to 25% of each wall surface

Sound Isolation

The base construction for Classrooms, Labs, Lab Support, Offices and Prep Rooms should be expected to be as follows.

- Base Construction
  - Walls: Full height stud wall with 3-5/8" metal studs, one layer of 5/8" gypsum wall on both sides of the wall and batt insulation in the cavity.
  - Floor/Ceiling: 5-12" composite slab, 3' deep plenum, acoustic ceiling tile finish with a minimum CAC of 35
  - Doors: Solid core wood door with minimum undercut of ¼", door frame silencers
- Exceptions
  - Mechanical Rooms
    - Walls: Wall construction will depend on the noise levels that will be generated by mechanical equipment housed in these spaces. Acoustic data for mechanical equipment will continue to be evaluated.
    - Doors: Anticipate perimeter door seals and fiberglass or mineral fiber filled metal doors and frames

Mechanical System Noise Control

- Mechanical systems in occupied spaces should be designed to achieve the following background noise level limits:
  - Classrooms: NC-30 to NC-35
  - Labs and Lab Support : NC-45 to NC-50
  - Offices: NC-35 to NC-40
  - Prep: NC-45 to NC-50
- The following mechanical system treatments should be anticipated:
  - Oversized ducts serving spaces with background noise requirements below NC-35.
  - Air service should be delivered via individual duct branches from an adjacent corridor. Ducts may not pass directly between adjacent spaces with background requirements below NC-35
  - Acoustically enhanced RA transfer ducts for spaces with background noise requirements below NC-35
  - Terminal unit boxes must not be placed above spaces with background noise requirements below NC-35
  - Terminal unit boxes serving spaces with background noise requirements below NC-35 must be outfitted with duct silencers and/or have acoustical lining in its downstream ductwork
  - Duct silencers on the intakes and discharges of all major air handling equipment
  - All major powered equipment (chillers, air handlers, exhaust fans, etc.) will be installed on neoprene and spring isolators
  - Pumps will likely require concrete inertia bases

6.1.15 Restrooms

Restroom ceilings will be constructed of painted gypsum board.

Restroom partitions will be solid phenolic and will be floor mounted with overhead bracing.

Restroom accessories provided by UW-La Crosse include: toilet paper dispensers, paper towel dispensers, feminine hygiene dispensers, soap dispensers, and trash receptacles.

Restroom lavatories will be constructed of solid surface countertops with steel support brackets, and stainless steel under-mounted sinks.

Porcelain tile will be installed on toilet room walls from floor to ceiling.

Stainless steel hands-free hand dryers and paper towel dispensers will be provided.

One full-length mirror to be provided at each restroom.

6.1.16 Signage

Provide interior room signage, directories, and wayfinding graphics throughout the building.

Digital signage will be considered in main corridors and lobby spaces.

Provide exterior building signage at the west and north entrances.

6.2 Laboratory Systems

6.2.1 Laboratory Planning Organization

The University of Wisconsin-La Crosse Instructional Science Facility Phase 2 will house specialty, computer, and instructional labs for the departments of Biology, Chemistry, Geography & Earth Science, and Physics. The new laboratories are organized around adjacencies to phase one labs and ideal locations for environmental control.

The programming and planning effort established a recommended mix of class laboratories, computer laboratories, support spaces, and research laboratories. The primary research laboratories in phase II are dry-bench computational spaces. Offices, conference rooms and break areas are not included in Phase II and are located to work with the thematic organization of laboratories established in Phase I.

Additionally, specialty lab facilities are included as part of Phase II consisting of:

- Planetarium (Optional/Future)
- Animal care research center
- Maker lab
- Specimen museum
- Greenhouse
- Rooftop observatory

6.2.2 Class Laboratory and Laboratory Support Planning Criteria

The class laboratories and support space needs were discussed with the departmental representatives from UW-La Crosse. Methods of teaching were discussed, and consideration was given to layouts that would best support the learning experience. Generally, students work together in teams. As a result, it is better to provide student work benches sized for teams rather than long runs of student benches. It was also noted that reconfiguring the student work benches was not a requirement for the mycology labs; however, the Science Education Methods and Mathematics labs would benefit from movable student benches to allow for optimal configurations.

Class Lab support spaces have a variety of uses from preparation of student materials to student equipment storage. In order to accommodate the various uses, layouts for these rooms include work benches, storage cabinets, and equipment zones.

6.2.3 Casework/Workbench Systems

Selection of a fixed and flexible casework systems and furniture, when combined with the recommended building module and an adequate vertical and horizontal distribution, assure a high-degree of flexibility for all aspects of the laboratory. Through the planning effort we determined the following utilization of casework systems:

Computer Labs

The computer labs are planned to be instructional and extra-curricular and having the technology operational at the beginning of class was considered highly important. If the student computer tables were movable it could affect the connectivity and there was not a desire to reconfigure these rooms. To meet these needs, we propose using a fixed table system to support the necessary power and data infrastructure to support the ideal layout developed with the users during programming. Utilizing tables rather than built in millwork will allow for long-term flexibility to reconfigure the room as teaching modalities evolve; but, will provide fixed class lab configurations on a daily basis.

Mycology Class Labs and Lab Support

We propose using a fixed casework system at these wet-bench instructional spaces, as most class lab and lab support layouts are not desired to be reconfigurable. For class labs, the system consists of a work surface with fixed storage below at the student work areas. The perimeter of the rooms will have work surfaces with fixed storage below and above in most cases. The fixed storage above will be adjustable shelves and/or cabinets. For class lab support spaces, the system consists of a combination of work surfaces and storage units. Some storage units will be the movable wire shelving type.

- Most sinks and work surfaces shall be grey, epoxy resin
- Eyewash/Drench Hose units will be located at sinks in class and research labs
- Emergency Shower and Eyewash units will be located in rooms containing fume hoods

Animal Care Research Center

We propose using a perimeter of fixed stainless steel casework with stainless steel countertops in the procedure rooms of the Animal care research center.

- Most sinks and work surfaces shall be stainless steel

Science Education Methods and Mathematics Labs

We propose using a movable table student bench solution at these dry-bench instructional spaces. The perimeter of the rooms will have work surfaces with fixed storage below and above in most cases. The fixed storage above will be adjustable shelves and/or cabinets. For class lab support spaces, the system consists of a combination of work surfaces and storage units. Some storage units will be the movable wire shelving type.

- Most sinks and work surfaces shall be grey, epoxy resin

Greenhouse Labs

We propose using a perimeter of fixed casework system for general lab use and movable grow tables. Greenhouse layouts are desired to be reconfigurable to allow for different sized species to be grown. The perimeter of the rooms will have stainless steel work surfaces with fixed storage below and above in most cases. The fixed storage above will be adjustable shelves. For class lab support spaces, the system consists of a combination of work surfaces and storage units. Some storage units will be the movable wire shelving type.

- Most sinks and work surfaces shall be stainless steel

Other Labs and Lab Support

We propose using a perimeter of fixed casework system for general class lab use and movable tables, as most class lab and lab support layouts are not desired to be reconfigurable. For class labs, the system consists of a work surface with fixed storage below at the student work areas. The perimeter of the rooms will have work surfaces with fixed storage below and above in most cases. The fixed storage above will be adjustable shelves and/or cabinets. For class lab support spaces, the system consists of a combination of work surfaces and storage units. Some storage units will be the movable wire shelving type.

- Most sinks and work surfaces shall be grey, epoxy resin
- Eyewash/Drench Hose units will be located at sinks in class and research labs
- Emergency Shower and Eyewash units will be located in rooms containing fume hoods

Specimen Museum

We propose using a frameless glass museum display case system with adjustable height shelves, lockable doors, and integrated lighting to property display the university's collection. The collection's specimens vary in size and weight so multiple types of cabinets will be required to properly display all types of items. A portion of the museum should house movable tables to allow the museum to function as an instructional space for students and visitors to study the collection.

6.2.4 Acoustical and Vibration Sensitivity

The Sound Transmission Class (STC) is as follows:

- Laboratories without fume hoods: 45
- Laboratories with fume hoods – speech communication is anticipated/expected: 45

The Noise Coefficient (NC) is as follows:

- Laboratories without fume hoods: 45
- Laboratories with fume hoods – speech communication is anticipated/expected: 45

Vibration Sensitivity

- Typical Criteria – 2000 μIN/SEC

6.2.5 Laboratory Guideplates

Refer to Appendix A for detailed guideplate diagrams of each laboratory space.

6.3 Structural Systems

6.3.1 Foundation System

A geotechnical report by Chosen Valley Testing, Inc. has been provided for this site. Soil borings indicated water levels at 36.5'-43' below grade. With the water level being so deep and the use of free-draining backfill against the below- grade walls, there should be no foundation drainage system required.

A presumptive allowable bearing capacity of 8,000 psf will be used for the design. Based on the soil bearing capacity, the total post-construction settlements are estimated to be 1 inch or less with differential settlements of ½" or less. The proper implementation of the site improvements indicated in the soils report is necessary to achieve the 8000psf soil bearing capacity.

The soil borings indicated that the soils on the site are dominated by natural sands which are covered with fill materials and possible fill materials on some areas. The fill materials will need to be removed from the building footprint and replaced with clean compacted sand. The depth of the fill material ranges from 5 to 9 feet.

The sands on this site were found to be natural sands which are commonly rather loose. To reduce settlement potential and increase the friction angle of the soil, and thereby allowing a higher bearing capacity, the site should be heavily surface compacted with a large, vibratory drum roller or "hoe-ram" compactor before placing the foundation system.

Foundations for the heated structures will be set at a minimum of 48 inches below exposed grade for frost protection. Footings for unheated structures should be placed a minimum of 60" below finished grade.

There will be a future Phase 2 addition that will connect to the Phase 1 construction. The foundation for Phase 1 will be designed to accommodate the future phase two construction.

A vapor retarder is recommended under all slabs that will receive sensitive floor coverings. It will be evaluated if this vapor retarder should be placed directly below the slab or under a sand layer.

The slab on grade will be 4 inches unless thicker slabs are needed for heavier loading. The slabs will be designed using a subgrade modulus of 250 pci. There are a couple rooms in the basement that may require full isolation and heavy slabs to minimize vibrational concerns with special sensitive equipment.

Seismic soil classification for this site is considered to be a Site Class D. The seismic acceleration parameters are S_S of 0.05 and S_1 of 0.04.

6.3.2 Laboratory Vibration/Structural Consideration

Vibration criteria for areas intended to accommodate sensitive equipment are based on Vibrational Velocity as measured in one-third octave bands of frequency over the range of 8-80 Hz for equipment without internal pneumatic isolation. For this facility, we will be designing the structural system to satisfy the limiting velocity of 2,000 in/sec per CRSI Publication No. 10-DG-VIBRATION Table 3.3 Acceptance Criteria for Sensitive Equipment.

6.3.3 Floor Framing – Office and Large Lecture Rooms

The proposed office and large lecture area massing, as well as the occupancy type/loading, makes steel framing in this area a more logical choice. A preliminary analysis was done based on the typical walking foot fall vibration/ occupant comfort criteria. For these areas, a 6½" composite slab on metal deck acting compositely with steel beams is the most economical system. Depths for this system vary. Typical beam framing is 24" or less. Allowing depth for spray on fireproofing on the beams, the typical system should be the same depth or less deep than the adjacent concrete framing. Due to lesser mechanical requirements and floor-to-floor heights relative to the lab block, this depth should be acceptable. If necessary to accommodate mechanical design with architecturally acceptable floor to ceiling heights in the non-lab areas, some steel members could possibly be made shallower than the current design by using less economical structural steel sections.

The proposed planetarium area massing makes concrete framing in this area the logical choice. The dome roof will also be a concrete shell lid that will be designed to support the added green roof of the landscape above.

6.3.4 Floor Framing – Laboratory

The basic bay size module is approximately 21' x 30'. A concrete system for this bay size will be standard pan/joist system 26 3/4" in depth. Both the support girder beams and joists would be this depth. The concrete beams are assumed to be 30" wide in the center bays and 24" wide along the perimeter. The concrete joist will have a 20" deep pan and the spacing will be roughly 38" o.c. with 8" ribs and a 6 3/4" top slab. The concrete compressive strength to be specified for all floor framing and columns will be 5 ksi. The columns are assumed to be 24" square. The concrete system, while being inherently fire-proofed, also provides stiffness/mass for vibration control. As equipment vibrational requirements become more defined, due consideration will be made for the system design.

On Level 1 in area A at between grids 2 and 3.5 and B to F, the slab will be recessed to allow for radiant flooring. The recess will be 4" deep. This will allow for a 3" topping over the radiant tubing over a 1" rigid insulation over the structural system. Where this occurs over the 8" slab, the slab will be lowered to account for the topping. Where this occurs over the pan joist system, the pan will be reduced to an 18" deep pan and the system will be lowered an additional 2". Where this occurs at the slab on grade, the insulation will be placed over the vapor retarder and the tubing will be cast within the 4" slab on grade.

The mechanical penthouse floor and the main roof will have similar joist framing as the floors below. Special design consideration will be taken for any heavier loading within the penthouse or in the screened wall areas.

6.3.5 Floor Framing – Corridors

The corridors will be an 8" flat reinforced concrete slab system. This thinner structure in the corridors will allow for more space for mechanical, electrical and plumbing systems. To support these systems, an embedded channel will be installed in the concrete for a cleaner more flexible system. At the south west and northeast corridors, the slab edge at the exterior will have a drop beam. There will be round columns in these spaces to support the floors.

6.3.6 Roof Framing

The penthouse roof framing is a steel-framed system. Wide flange steel member will be used through-out to provide more flexibility in hanging mechanical equipment or piping now and in the future. Fire-proofing will also be required on these system elements.

6.3.7 Mechanical Screened Area

The mechanical screened area will have galvanized steel tube columns and beams. The beams will be placed at two locations; the top tube will be placed at the top of the screen wall and the bottom tube will be placed a few feet above the roof deck. The columns will be braced with tube steel kickers back down to the roof structure. These kickers will be within the screened area.

6.3.8 Exterior Walls

The exterior walls will be a non-load bearing 8" CMU with lightly reinforced vertical cells with a brick or cast-stone finish with punched window openings. At the exterior corridors the exterior walls will be glazed curtain wall. The cmu walls will bi-pass the concrete structure requiring special detailing to tie the two systems together.

The mechanical penthouse will have non-load bearing 8" cold-formed metal studs at 16" oc.

6.3.9 Stairs

The stairs will be a steel pan with concrete topping system. The stringer types may vary between the west and east stair. With the east stair being more open and having a long straight run, the use of tube stringers will be used.

6.3.10 Lateral Resistance

Lateral systems to resist the forces due to wind, seismic, and unbalanced earth pressure will be reinforced concrete shear walls. Shear walls will mostly be 12" thick except for one north sourth wall in the center of the building which will be 8". The shear walls will be placed in areas such as stair and elevator shafts, mechanical shafts, restroom blocks, or other walls that likely remain unchanged over time. Resistance will be required in both north-south and east-west directions. The steel framed penthouse will have braced frames to resist lateral forces.

6.3.11 General Structural Design Parameters

International Building Code (IBC), latest version adopted by Wisconsin (2015)

Wind and Seismic: per requirements of ASCE 7 (American Society of Civil Engineers).

Snow loading: per requirements of ASCE 7. Both basic and drifted snow requirements. LaCrosse area ground snow load – 40 psf

6.3.12 Floor Loading

First floor public areas and corridors - 100 psf Live

Corridors – upper levels - 80 psf Live

Lab areas – all levels – 125 psf Live, as determined by equipment needs and future flexibility requirements.

Mechanical – as required by equip. but not less than 100 psf

6.4 Fire Protection Systems

6.4.1 Codes and Standards

The Fire Suppression Systems will be designed in accordance with the following Codes:

Wisconsin Department of Safety and Professional Services

The Fire Protection Systems will be designed in accordance with appropriate portions of the following Guidelines and Standards:

Department of Facilities Development Management Design
University of Wisconsin – La Crosse Facilities, Planning and Development Peer Review Comments
NFPA Standards 13 and 14
City of La Crosse Ordinances

6.4.2 Systems Descriptions

Water Service

A six-inch combination (plumbing and fire protection) water service installed by the site utility contractor will supply the fire suppression system. A six-inch flanged connection will be provided by the plumbing contractor. The Fire Protection contractor will install a double detector check valve to isolate the potable water from the fire suppression system.

Standpipe System

A Class 3 Standpipe system installed per NFPA 14 will be installed in each fire rated stairs. One combination standpipe / riser zoned for each floor will supply the wet fire suppression systems. Fire Hose valves will be installed at each intermediate landing and the roof.

Standpipe System Materials will include:

Schedule 10 black steel pipe with grooved fittings

Sprinkler System

Wet and dry sprinklers will be installed throughout the building to provide 100% protection in accordance to NFPA 13. Exceptions allowed by NFPA 13 will eliminate sprinklers in the main electrical rooms that are constructed to a minimum fire rating of 2 hours.

Occupancy Hazards will include:

General Offices	Light Hazard
Classrooms	Light Hazard
Laboratories	Ordinary Hazard – Group 1
Laboratories (Flammable)	Ordinary Hazard – Group 2
Mechanical Rooms	Ordinary Hazard – Group 1

Sprinkler System Materials will include:

Wet Systems

Piping 2” and under – Schedule 40 black steel piping and malleable iron fittings
Piping 2-1/2” and larger – Schedule 10 black steel piping and grooved fittings

Sprinkler Specialties will include:

Flexible sprinkler drops
Concealed sprinklers in finished areas

6.5 Plumbing Systems

6.5.1 Codes and Standards

The Plumbing Systems will be designed in accordance with the following Codes:

Wisconsin Department of Safety and Professional Services SPS 381 thru 384

The Plumbing Systems will be designed in accordance with appropriate portions of the following Guidelines and Standards:

Department of Facilities Development Management Design Guidelines and Peer Review Comments

University of Wisconsin – La Crosse Facilities, Planning and Development Peer Review Comments

6.5.2 Systems Descriptions

Sanitary Drain, Waste and Vent

Public and non-laboratory fixtures and drains will be connected to the sanitary system.
The basement underground sanitary system will be pumped utilizing a sump and duplex ejectors to the gravity drain located in the basement ceiling.
The Vivarium will drain to duplex submersible slicer pumps to compensate for bedding materials.
The interior sanitary drain will be connected to the exterior sewer that will utilize an exterior sampling manhole to monitor ph values of the effluent.
Because the laboratory HVAC system is vented; plastic materials may be utilized.

System Materials:

PVC schedule 40 DWV pipe and fittings

Mechanical Room and High Temperature Discharge from Lab Equipment Drains - CPVC schedule 40 pipe and DWV fittings

6.5.3 Acid Drain, Waste and Vent

An acid waste system will be utilized to drain all laboratory fixtures and drains. Drains supporting laboratory emergency fixtures will utilize the acid waste system for pipe economy.
An interior acid waste basin will neutralize basement drain and waste prior to connection to the sanitary duplex ejector.
An exterior acid dilution basin will neutralize any effluent prior to connection to the sanitary sewer lateral.

System Materials:

CPVC schedule 40 pipe and DWV fittings

6.5.4 Storm / Clear Water Drain, Waste and Vent

The system will consist of gravity storm water conductors, HVAC condensate drains, environmental room cooling unit drains and the drains serving the pure water plant.
The basement underground clear water drains and area drains will discharge to a sump with duplex pumps.
The exterior foundation drain tile will also connect to the sump.

System Materials:

Gravity –PVC schedule 40 pipe and DWV fittings with insulated roof drains and horizontal piping.

Pressurized – Type M copper pipe and soldered copper fittings

6.5.5 Foundation Drain tile

An underground perimeter drain tile system located above the exterior structural footings will drain excessive groundwater. The drain tile lateral will connect to the clear water sump and duplex pumps.

System Materials:

Flexible, perforated, corrugated high density polyethylene (HDPE) pipe encased in a geotech fabric envelope.

6.5.6 Domestic Water Systems

All water will be metered.
All hot water will be softened.
Tempered water (85 degree) will be supplied to laboratory emergency fixtures via point of use mixing valves
Hot Water maximum temperature will be set at 120 degrees.
A separate booster heater will be required for the cage wash
Hot Water return will be set at 110 degrees.
HVAC make up water will be isolated by reduced pressure backflow preventers (RPBPs).
A backflow preventer will protect the potable water in the Vivarium.

System Materials include :

Type L hard copper pipe with soldered copper fittings.
Schedule 10 stainless steel for piping 2-1/2" and larger
CPVC Schedule 40 with solvent welded fittings
All piping to be insulated.
Valves to include stainless steel trim.

6.5.7 Pure Water Systems

A pure water plant will supply reagent grade water to laboratory faucets. The plant will be supplied softened water for the building water softeners to extend RO membrane life. The plant will consist of:

Multiple reverse osmosis membrane assemblies
Storage tank
Duplex UV light assemblies
Carbon Filter
Multiple DI tanks for final polishing
Circulating and Pressure duplex stainless steel pumps

Reagent grade water will be piped with a recirculation loop back to the plant.

System Materials:

Schedule 80 Low Extractable High Purity Piping System

6.5.8 Fuel Gas

The main and riser natural gas system will be based on a system operating pressure of 2 psi.

The 2 psi gas pressure will be utilized by the emergency generator and plumbing equipment.
At each floor level, the branch pressure from the riser will be reduced to 14 inches of water column for laboratory use.

Each floor will have a riser branch shut-off valve and accessible individual lab shut-off valves will provide control of the natural gas distribution.

System Materials:

Schedule 40 black steel pipe with malleable iron fittings.

6.5.9 Laboratory Specialty Gas

Laboratory specialty gases will be supplied from a tank manifold supplied by others.
The system will be distributed at an operating pressure of 55 psi to wall and deck turrets.

System Materials:

Type L hard copper pipe with brazed copper fittings

6.5.10 Laboratory Compressed Air

Laboratory compressed will be supplied from a central air compressor plant. Two line pressures will be available:
100 psi for specific laboratory equipment
55 psi for general laboratory use

System Materials:

Type L hard copper pipe with brazed copper fittings

6.5.11 Laboratory Vacuum

Laboratory vacuum will be supplied from a central vacuum plant.
The system will be to wall and deck turrets.

System Materials:

Type L hard copper with soldered copper fittings

6.5.12 Plumbing Specialties

Commercial grade, cast iron body roof drains, clean outs, floor drains and hub drains complying with the DFDM Master Specifications.
Cross connection control devices meeting ASSE standards with discharge trough
Water meter
Exterior wall hydrants

6.5.13 Plumbing Equipment

Two gas fired water heaters (natural gas is utilized because of UW La Crosse's steam summer shut down)
One\circulating pumps
Triplex water softeners
Central laboratory air compressor assembly
Central laboratory vacuum pump assembly

6.5.14 Plumbing Fixtures

Public fixtures to be commercial grade, low flow fixtures complying with the DFDM Master Specifications

Laboratory fixtures supplied by the plumbing contractor will be combination recessed emergency eyewash and shower units

6.5.15 Laboratory Fixtures / Equipment

Fixtures and equipment supplied by others but connected by the plumbing contractor include:
Fume hoods with cup sinks and faucets
Epoxy Cup sinks with faucets
Epoxy sinks with faucets
Counter mounted, swing away eyewashes
Re-circulated type pure water faucets
Wall and bench mounted gas turrets
Sterilizers or autoclaves
Specialty gas manifolds
Cage Washer
Bottle Filler

6.5.16 LEED Options

Low flow public fixtures will be utilized throughout. Fixture flows to include:
Water Closets – Dual flush with an average of 1.28 gallon per flush (gpf)
Urinals – Battery powered, sensor operated, 1 gpf
Lavatories - .5 gallons per minute (gpm) aerators
Sinks – 1.5 gpm aerators

6.6 HVAC Systems

6.6.1 Project Goals

Sustainable Design

The project is intended to be designed to version 2.0 of the Division of Facilities Development Sustainable Facilities Standard.

Design Prerequisites and Credits which may directly affect the HVAC design include:

- EA Prerequisite 1 - Fundamental Commissioning of the Building Energy Systems
- EA Prerequisite 2 - Minimum Energy Performance
- EA Prerequisite 3 – CFC Reduction in HVAC&R Equipment
- EA Credit 1 – Optimize Energy Performance
- EA Credit 3 - Enhanced Commissioning
- EQ Prerequisite 1 – Minimum IAQ Performance
- EQ Credit 1 – Outdoor Air Delivery Monitoring
- EQ Credit 3.1 – Construction IAQ Management Plan: During Construction
- EQ Credit 3.2 – Construction IAQ Management Plan: Before Occupancy
- EQ Credit 5 – Indoor Chemical & Pollutant source Control
- ID Credit – Fume Hood Cx
- ID Credit – Advanced Energy Metering

Redundancy

The ability to continue to operate areas of the facility in the event of equipment failure is very important.

Many of the systems will be designed with redundant components to meet this requirement.

Refer to the individual descriptions for the level of redundancy included in each system or component.

Reserve Capacity

Major infrastructure components with a long life expectancy will be selected to support flexibility for future use.

Where possible and practical, distribution systems will be designed to be expandable and/or adaptable to support future use.

Refer to the individual divisions for the level of reserve capacity included in each system or component.

6.6.2 Applicable Codes, Guidelines, and Standards

The codes and standards listed below are considered to provide the minimum design requirements necessary. Actual design parameters may exceed these requirements where appropriate.

The currently adopted codes and most recent editions of the following referenced standards shall apply.

- Wisconsin Enrolled Commercial Building Code
- International Building Codes
  - International Mechanical Code – 2009
  - International Fuel Gas Code – 2009
  - International Energy Conservation Code - 2009
- ASHRAE Laboratory Design Guideline - 2001
- ACGIH Industrial Ventilation – A Manual of Recommended Practice for Design - 2013
- ANSI/AIHA Z9.5 – Laboratory Ventilation - 2012
- Occupational Safety and Health Administration (OSHA)
- ASHRAE Standard 55 – Thermal Environmental Conditions for Human Occupancy – 2007*
- ASHRAE Standard 62.1 - Ventilation for Acceptable Indoor Air Quality – 2007*
- ASHRAE Standard 90.1 – Energy Standard for Buildings – 2007*
- Guide for the Care and Use of Laboratory Animals – National Research Council - 2011
- National Fire Protection Association (NFPA) standards:
  - NFPA 30 – Flammable and Combustible Liquids Code
  - NFPA 45 – Laboratories Using Chemicals
  - NFPA 54 – National Fuel Gas Code
  - NFPA 90A – Standard for the Installation of Air Conditioning and Ventilating Systems
  - NFPA 101 – Life Safety Code
- Sheet Metal and Air Conditioning Contractors National Association (SMACNA)
- DFDM – HVAC Design Guidelines
- University of Wisconsin – La Crosse Design Standards

Notes:
- Codes/Standards marked with * used for Sustainable Facilities Standard compliance. ASHRAE Standard 90.1 used for energy code compliance.
- It is anticipated that the State of Wisconsin will adopt the 2015 International Codes in the near future. The project will be designed for the codes anticipated to be in effect at the time of plan review, more stringent code requirements than those listed may apply.

6.6.3 Base Design Criteria

A. Design Conditions

Outdoor Design Conditions		
	Dry-Bulb Temperature	Wet-Bulb Temperature
Outdoor Air Temperature	91^{O}F	74^{O}F
Outdoor Air Winter	-15^{O}F	-
Ambient	95^{O}F	78^{O}F

Interior Design Conditions - Occupied spaces which do not have specific space condition requirements		
	Summer	Winter
Dry-Bulb Temperature	76^{O}F ± 2^{O}F	68^{O}F ± 2^{O}F
Relative Humidity	50% max ± 5%	20% min ± 5%

Interior Design Conditions – Telecommunication Rooms		
	Summer	Winter
Dry-Bulb Temperature	80^{0}F max	65^{0}F min
Relative Humidity	30% min, 55% max	

Interior Design Conditions – Mechanical Rooms		
	Summer	Winter
Dry-Bulb Temperature	95^{0}F max	60^{0}F min
Relative Humidity	Not Controlled	

Interior Design Conditions – Electrical Rooms		
	Summer	Winter
Dry-Bulb Temperature	80^{0}F max	65^{0}F min
Relative Humidity	Not Controlled	

Interior Design Conditions – General Office		
	Summer	Winter
Dry-Bulb Temperature	76^{0}F ± 2^{0}F	68^{0}F ± 2^{0}F
Relative Humidity	50% max ± 5%	20% max ± 5%

Interior Design Conditions – Laboratory		
	Summer	Winter
Dry-Bulb Temperature	76^{0}F ± 2^{0}F	68^{0}F ± 2^{0}F
Relative Humidity	60% max ± 5%	20% max ± 5%

Final space temperature and humidity will be determined to meet Owner's special requirements for various lab spaces.

Interior Design Conditions – Vivarium		
	Summer	Winter
Dry-Bulb Temperature	72^{0}F ± 2^{0}F	72^{0}F ± 2^{0}F
Relative Humidity	40% max ± 5%	40% max ± 5%

Booster humidification will be provided as applicable.
Room level dehumidification will be provided as applicable.
Final space temperature and humidity will be determined to meet Owner's special requirements.

Interior Design Conditions – Classrooms		
	Summer	Winter
Dry-Bulb Temperature	76^{0}F ± 2^{0}F	68^{0}F ± 2^{0}F
Relative Humidity	50% max ± 5%	20% max ± 5%

Interior Design Conditions – Common Areas (Lobby, Support, etc.)		
	Summer	Winter
Dry-Bulb Temperature	$76^{O}F \pm 2^{O}F$	$68^{O}F \pm 2^{O}F$
Relative Humidity	50% max ± 5%	20% max ± 5%

Interior Design Conditions – Unoccupied Spaces		
	Summer	Winter
Dry-Bulb Temperature	$65^{O}F$ - $95^{O}F$	
Relative Humidity	Not Controlled	

B. Heating and Cooling Loads

Heating and Cooling Loads - Electrical		
	Lighting	Equipment
General Office	Per Division 26	1.0 watts per sq. ft.
Common Areas	Per Division 26	0.5 watts per sq. ft.
Laboratory (low intensity)	Per Division 26	4.0 watts per sq. ft. *
Laboratory (medium intensity)	Per Division 26	8.0 watts per sq. ft. *
Laboratory (high intensity)	Per Division 26	12.0 watts per sq. ft. *
Laboratory Prep	Per Division 26	8.0 watts per sq. ft. *
Classrooms	Per Division 26	0.5 watts per sq. ft.
Corridor	Per Division 26	0.0 watts per sq. ft.
Storage Rooms	Per Division 26	0.0 watts per sq. ft.

** To be determined by actual equipment load, but not less than that indicated.*

1. Rooms with large equipment shall be calculated for actual equipment load, per space program and equipment data. This includes Elevator Equipment, Electrical and Telecom rooms.
2. Where specific lighting load information is not available, an average of 1.5 watts per square foot will be used until actual lighting load information is confirmed.
3. Equipment Diversity: 80%

Heating and Cooling Loads - Occupants		
	Sensible	Latent
General Office Activity	250 Btuh/person	200 Btuh/person
Light Bench Work	275 Btuh/person	475 Btuh/person

1. Occupant heat rejection will be adjusted as appropriate for physical activity at individual spaces.
2. The number of occupants in each space will be based on the actual occupant density listed in the facility program.
3. Occupant Diversity: 80%

C. Acoustical Criteria

1. Outdoors (at property line): 55 NC
2. Indoors
   a. Conference Rooms: 30 NC
   b. Classroom Areas: 30 NC
   c. Common Areas: 40 NC
   d. Laboratories: 45 NC
   e. Vivarium 35 NC
   f. General Office/Work Areas: 40 NC
   g. Private Offices: 35 NC
   h. Service/Support Areas: 40 NC
   i. Corridors and Public Areas: 40 NC
3. Exterior mechanical equipment will be evaluated for anticipated sound levels and attenuation provided as appropriate to comply with all applicable local noise requirements.
4. Diffusers and grilles will be selected at performance criteria of 5 NC lower than the levels indicated above.

D. Filtration Rates:

1. Prefilters (30% efficient) and final filters (90% efficient) will be provided on air handling systems serving all conditioned spaces.
2. Room level HEPA filters will be provided where appropriate (Vivarium, Specialty Lab areas, etc.)

E. Infiltration

1. The building heat loss calculations will include an infiltration load based on 0.15 cfm of infiltration air per square foot of exterior wall area.
2. Infiltration rates of 200 cfm per door or up to 10 air changes/hour will be used for main entrances. Infiltration rates of 200 cfm per door will be used for secondary entrances and exits.

F. Building Envelope

1. Performance criteria for building envelope construction materials shall be as provided by the Architect.
2. Construction material coefficients will comply with the State of Wisconsin and International Energy Conservation Code requirements.

G. Vibration Elimination Criteria

1. All HVAC equipment shall be isolated per Chapter 48 of the ASHRAE - HVAC Applications handbook.

H. Ventilation Rates

1. Outdoor Air:
   a. As required by ASHRAE 62 or Owner's Program Requirements if more stringent.
2. Minimum Air Changes:

a. As required by ASHRAE 62 or Owner's Program Requirements if more stringent, or greater where required to meet cooling load.
b. All rooms shall be designed for a minimum of 0.4 cfm/sf, or 30% of the maximum cooling air volume, whichever is greater.
c. Minimum exhaust ventilation rates will be as follows. Actual ventilation rates may exceed these values if calculations so dictate.

1).	Lab (low hazard):	3 air changes/hour (unoccupied) 6 air changes/hour (occupied)
2).	Lab (high hazard):	4 air changes/hour (unoccupied) 8 air changes/hour (occupied)
3).	Lab Corridors:	2 air changes/hour
4).	Toilet Rooms:	Maximum of 10 air changes/hour or 75 cfm/fixture
5).	Janitor Closet:	Maximum of 10 air changes/hour, 2 cfm/sf or 75 cfm/fixture
6).	Vivarium:	15 air changes/hour
7).	Greenhouse:	4 air changes/hour

Note: "low hazard" occupancy where limited or no chemical use, "high hazard" occupancy where chemicals typically used/stored.

d. Sufficient outdoor air shall be provided as required for make-up air to the exhaust system, keeping areas at proper pressure relationships to adjacent spaces.

I. Building Pressure Relationships
1. As defined by ASHRAE 62 or Owner's Program Requirements. Generally pressures shall be as follows:

Space/Area	Air Movement
Offices	Neutral
Classrooms	Neutral
Main Corridor	Neutral
Toilet, Janitor Closet	In
Laboratory	In
Laboratory Offices	Out
Laboratory Corridors	Out (adjacent to labs)

6.6.4 Specific Building Issues

High Rise: The building is not considered a high rise.

Atrium: The facility does not contain an atrium.

Seismic Requirements: The project falls into seismic design category A. Seismic restraints should not be necessary for the building mechanical systems.

6.6.5 HVAC System Analysis

Multiple system options have been evaluated during the preliminary design phase with regards to energy efficiency and life-cycle costs. These systems include a heat recovery chiller and air-to-air heat recovery (run-around loops).

6.6.6 Chilled Water System

Mechanical cooling will be provided from the campus chilled water system, utilizing the available capacity from chillers installed at the new West Campus Chiller Plant.

The proposed phase two building is anticipated to have a 600 to 700 ton cooling load.

The proposed phase two building is anticipated to use the existing chilled water service mains currently serving Cowley Hall. Chilled water supply and return mains will be extended approximately 120 feet to the new utility landing below the primary entrance on the south side of the building. Isolation valves will be provided at the at the connection points to the existing chilled water system and in the basement mechanical room where the chilled water piping enters the building. The Phase I and Phase II chilled water systems are not anticipated to be cross connected.

A secondary chilled water pump is not anticipated due to the pumping capabilities of the plants and the building's close proximity to the plants.

The central air-handling equipment will be furnished with chilled water coils. The chilled water piping will remain charged during the cooling season. Coils will be drained and dried via connection to the high pressure side of air handling systems during the non-cooling season. Terminal equipment will be selected for 44 ºF entering chilled water temperature to allow for temperature rise through the distribution system.

Process Cooling Water - To be determined based on process requirements. Campus chilled water will be used to cool laboratory equipment as required. A heat recovery chiller will serve as the primary backup to the campus chilled water system. In addition, there is the ability to use the underground chilled water piping system for geothermal capabilities. There would be multiple modules on the heat recovery chiller that will provide a reduced standby cooling capacity if one of the modules goes down or is shut down for maintenance.

6.6.7 Steam Systems

High pressure steam for this facility will be provided from the campus boiler plant to be utilized for building heat and humidification. Steam will not be available during the annual plant shutdown period. A standby boiler will not be provided for use during the plant shutdown. Domestic hot water will be heated by standalone gas fired water heaters provided by the plumber.

New High Pressure Steam and Pumped Condensate Return lines will be extended approximately 230 feet from the existing Steam Pit on the south side of the building to the new utility landing below the primary entrance on the south side of the building. Phase I and II will not have steam cross connected.
Option: Construct a new steam pit at the existing steam main south of the building, to the east of the current steam pit. Provide a "Z" bend to the utility landing on the south side of the building. This will reduce the length of pipe run in the east-west direction approximately 200 feet.

The phase two building will have Steam and Steam Condensate separately metered. Pressure reducing stations will provide high pressure steam at approximately 60 psig for laboratory and process loads and approximately 10 psig low pressure steam for building heating hot water and humidification loads. Pressure reducing stations will each be in a 1/3 – 2/3 arrangement and provided with safety relief valves. Steam condensate will be returned from heat exchangers, heating coils, humidifiers and equipment to a base-mounted duplex condensate pump system. The steam condensate meter will be provided with a bypass and measure steam condensate flow being returned to the campus steam distribution system.

6.6.8 Hot Water Heating Systems

The hot water pumping systems for the phase two building will utilize steam-to-hot water shell and tube heat exchangers and variable volume pumping. Two circulating pumps (one of them standby) will distribute hot water to air handling unit heating coils, reheat coils, radiation and unit heaters. Heating Hot water will be distributed at 130 degree with a 20 degree temperature drop. Hot water temperature will be reset based on outside air temperature. System to consist of the following:

- Two (2) steam-to-hot water heat exchangers (100% standby). Heat exchangers shall be piped in parallel with a 1/3 – 2/3 steam control valve arrangement.
- Two (2) end suction pumps, with suction diffusers and triple duty valves. Each pump will be selected for 100% of the design flow plus 10% additional flow for the by-pass filter.
- A VFD for each pump shall be provided for capacity control.
- An air eliminator and dirt separator with an automatic air elimination valve.
- A sidestream filter system designed for 10% of the flow. The filter system shall be piped across the pumps from the supply to the return piping.
- A bypass feeder to provide for chemical treatment
- Bladder type expansion tanks
- Automatic make-up water valves connected to a non-potable water supply
- Safety relief valves

The hot water heating pumps will be on the emergency power system.

6.6.9 Heat Recovery Chiller

An estimated 40 ton heat recovery chiller would be provided. The chiller would be sized to provide cooling for the vivarium/laboratory areas, process loads, elevator equipment rooms, and technology rooms. Space will be provided to allow for additional heat recovery chiller modules to serve future needs.

Two circulating pumps (one of them standby) will distribute chilled water for standby and process cooling loads. System to consist of the following:

- Two (2) end suction pumps, with suction diffusers and triple duty valves. Each pump will be selected for 100% of the design flow plus 10% additional flow for the by-pass filter.
- A VFD for each pump shall be provided for capacity control.
- An air eliminator and dirt separator with an automatic air elimination valve.
- A sidestream filter system designed for 10% of the flow. The filter system shall be piped across the pumps from the supply to the return piping.
- A bypass feeder to provide for chemical treatment
- Bladder type expansion tanks
- Automatic make-up water valves connected to a non-potable water supply

- Safety relief valves

The heat recovery circulating pumps will be on the emergency power system.

Heat will be rejected from the cooling to the heating loop, and would be used as a reduced standby source of heating during periods of steam shutdown. Excess heat will be rejected to the exhaust airstream when conditions require.

6.6.10 Central Air Handling Systems

Air Handling Units

A. Design Criteria

- Air Handling Unit Component Sizing
  1). Maximum allowable nominal face velocities for air handling unit components are as follows:
     a). Air Intake Louvers (free area) - 600 fpm.
     b). Hot Water Heating Coils - 500 fpm.
     c). Cooling Coils - 400 fpm.
     d). Pre-filters and Final-filters - 450 fpm.
     e). Sound Attenuating Devices - 1200 fpm.
- Common features:
  1). Casings: Foam filled or fiberglass insulated double wall units.
  2). Leakage Rates: 1% of rated CFM at 150% of design pressure.
  3). Drain Pans: Double wall, pitched, stainless steel, meeting all the requirements of ASHRAE 62. Provide drain pans in the following sections:
     a). Outdoor air intake.
     b). Downstream of cooling coils.
     c). In fan sections immediately downstream of cooling coils.
     d). Humidification sections.
  4). Access sections: 18" minimum width provided between each component.
  5). Access Doors
     a). Gasketed, double wall, positive latching with a view window; for section with UV lights windows shall have UV filters.
     b). Doors shall open up against pressure.
  6). Crane rails will be provided in fan sections for all motors over 50 Hp.
  7). Lights: Waterproof marine lights in each access section and fan section. Lights shall be prewired to switches outside each door.
  8). Vibration isolation: All fans shall be internally isolated.
  9). Pipe Stands (indoor units): 12" high minimum or as required to provide adequate clearance for cooling coil trap.
  10). Smoke Dampers: Provided as required by building code.
  11). Cooling coil bypass dampers: Where space is available, a bypass damper will be provided at the cooling coil to allow for reduced pressure drop when not in mechanical cooling mode.
- All systems will be a single duct, variable air volume reheat system providing heating, cooling, and humidification to the spaces. The systems for all areas will utilize a fully ducted return air system with Air Terminal Units (ATU's) on both the supply air side and the return air sides of the system.

- Refer to the individual air handling unit descriptions for intended hours of operation. Units noted to operate 24/7 may operate at reduced airflows during unoccupied periods.

B. Air Handling Units – (AHU – 1)
   - Serves: North Classroom/Office areas.
   - Location: Penthouse Mechanical Room.
   - Hours of Operation: 24/7 (unoccupied hours TBD).
   - CFM/SP: 50,000 cfm @ 7" TSP.
   - System Type: Blow through, VAV Reheat.
   - Reserve Capacity: None.
   - Redundancy: Partial redundancy with dual fans each unit sized for 50% of unit airflow. Distribution will be cross connected with AHU-2 unit serving the South Classroom/Office areas.
   - Packaged custom unit consisting of the following:
     1). 2" foam filled double wall casing.
     2). Return Air Fans, each with VFD and AFMS.
     3). Inlet and Discharge Isolation Dampers for each Return Fan.
     4). Return and Relief Air Dampers.
     5). Outside Air Intake Damper with AFMS.
     6). Air Mixing Device.
     7). 30% Efficient Pre-filters (summer and winter positions).
     8). Supply Air Fans, each with VFD and AFMS.
     9). Inlet and Discharge Isolation Dampers for each Supply Fan.
     10). Pumped Hot Water Heating Coil.
     11). Steam Humidification Dispersion Panel.
     12). Chilled Water Cooling Coil.
     13). Cooling Coil Bypass Damper.
     14). Final Filters (MERV 14).
     15). Sound Attenuation (may be installed in the ductwork).

C. Air Handling Units – (AHU – 2)
   - Serves: South Classroom/Office areas.
   - Location: Penthouse Mechanical Room.
   - Hours of Operation: 24/7 (unoccupied hours TBD).
   - CFM/SP: 50,000 cfm @ 7" TSP.
   - System Type: Blow through, VAV Reheat.
   - Reserve Capacity: None.
   - Redundancy: Partial redundancy with dual fans each unit sized for 50% of unit airflow. Distribution will be cross connected with AHU-1 unit serving the North Classroom/Office areas.
   - Packaged custom unit consisting of the following:
     1). 2" foam filled double wall casing.
     2). Return Air Fans, each with VFD and AFMS.
     3). Inlet and Discharge Isolation Dampers for each Return Fan.
     4). Return and Relief Air Dampers.
     5). Outside Air Intake Damper with AFMS.
     6). Air Mixing Device.
     7). 30% Efficient Pre-filters (summer and winter positions).
     8). Supply Air Fans, each with VFD and AFMS.

9). Inlet and Discharge Isolation Dampers for each Supply Fan.
10). Pumped Hot Water Heating Coil.
11). Steam Humidification Dispersion Panel.
12). Chilled Water Cooling Coil.
13). Cooling Coil Bypass Damper.
14). Final Filters (MERV 14).
15). Sound Attenuation (may be installed in the ductwork).

D. Air Handling Units – (AHU – 3)

- Serves: Laboratory areas.
- Location: Penthouse Mechanical Room.
- Hours of Operation: 24/7 (unoccupied hours TBD).
- CFM/SP: 18,000 cfm @ 7" TSP.
- System Type: Blow through, VAV Reheat.
- Reserve Capacity: None.
- Redundancy: Partial redundancy with dual fans each unit sized for 50% of unit airflow. Intent is to cross connect distribution with air handling unit AHU-4 serving the Vivarium area to provide additional redundancy.
- Packaged custom unit consisting of the following:
  1). 2" foam filled double wall casing.
  2). Outside Air Intake Damper.
  3). 30% Efficient Pre-filters (summer and winter positions).
  4). Supply Air Fans, each with VFD and AFMS.
  5). Inlet and Discharge Isolation Dampers for each Supply Fan.
  6). Pumped Energy Recovery Coil.
  7). Pumped Hot Water Heating Coil.
  8). Steam Humidification Dispersion Panel.
  9). Chilled Water Cooling Coil.
  10). Cooling Coil Bypass Damper.
  11). Final Filters (MERV 14).
  12). Sound Attenuation (may be installed in the ductwork).
- Unit will be designed to operate at 100% outdoor air supply with the use of the energy recovery system.

E. Air Handling Units – (AHU – 4)

- Serves: Vivarium areas.
- Location: Penthouse Mechanical Room.
- Hours of Operation: 24/7 (unoccupied hours TBD).
- CFM/SP: 18,000 cfm @ 7" TSP.
- System Type: Blow through, VAV Reheat.
- Reserve Capacity: None.
- Redundancy: Full fan redundancy with dual fans each unit sized for 100% of unit airflow. Intent is to cross connect distribution with the air handling unit serving the laboratory areas to provide additional redundancy for unit shutdown to allow for filter changes, coil cleaning/failure, etc.
- Packaged custom unit consisting of the following:
  1). 2" foam filled double wall casing.

2). Outside Air Intake Damper.
3). 30% Efficient Pre-filters (summer and winter positions).
4). Supply Air Fans, each with VFD and AFMS.
5). Inlet and Discharge Isolation Dampers for each Supply Fan.
6). Pumped Energy Recovery Coil.
7). Pumped Hot Water Heating Coil.
8). Steam Humidification Dispersion Panel.
9). Chilled Water Cooling Coil.
10). Cooling Coil Bypass Damper.
11). Final Filters (MERV 14).
12). Sound Attenuation (may be installed in the ductwork).

- Unit will be designed to operate at 100% outdoor air supply with the use of the energy recovery system.

F. Air Handling Units – (AHU – 5)

- Serves: Greenhouse.
- Location: Lower Level Mechanical Room.
- Hours of Operation: 24/7 (unoccupied hours TBD).
- CFM/SP: 9,000 cfm @ 7" TSP.
- System Type: Blow through, VAV Reheat.
- Reserve Capacity: None.
- Redundancy: Partial redundancy with dual fans each unit sized for 50% of unit airflow.
- Packaged custom unit consisting of the following:
  1). 2" foam filled double wall casing.
  2). Outside Air Intake Damper.
  3). 30% Efficient Pre-filters (summer and winter positions).
  4). Supply Air Fans, each with VFD and AFMS.
  5). Inlet and Discharge Isolation Dampers for each Supply Fan.
  6). Pumped Energy Recovery Coil.
  7). Pumped Hot Water Heating Coil.
  8). Steam Humidification Dispersion Panel.
  9). Chilled Water Cooling Coil.
  10). Cooling Coil Bypass Damper.
  11). Final Filters (MERV 14).
  12). Sound Attenuation (may be installed in the ductwork).
- Unit will be designed to operate at 100% outdoor air supply with the use of the energy recovery system.
- Booster cooling coil(s) and humidifier(s) will be provided to serve the various greenhouse conditions as appropriate. Exact space conditions will need to be confirmed with the users and design team.

Exhaust Systems

A. System Description

- General Exhaust Systems
  1). A general exhaust system shall be provided for the building.
  2). The system shall provide exhaust for the following rooms:
    a). Toilet Rooms.

b). Janitor's Closets.
c). Soiled Utility Rooms.
d). Storage Rooms.
e). Any other rooms requiring general exhaust by code.

3). Reserve Capacity: None.
4). Redundant Capacity: None.
5). Exhaust Fans: Backward inclined, belt drive, aluminum, power roof ventilators or backward inclined, belt drive square inline or mixed flow axial fans. Direct drive fans with ECM motors will be utilized when available for the fan size required.
6). Energy recovery module consisting of 4" foam filled double wall casing, stainless steel interior lining, inlet plenum, filter section, energy recovery coil, isolation/bypass dampers, outlet plenum and access doors.

- Laboratory Exhaust System
  1). All laboratory hoods shall be connected to a single laboratory exhaust system (except those with a hazard not appropriate to be combined with a central system). Variable volume control shall be utilized where appropriate.
  2). The laboratory exhaust system shall be constructed to comply with Wisconsin Administrative Code Section SPS-364.0607, NFPA 45 and International Mechanical Code Section 607.5.5. Smoke dampers shall not be provided at duct shaft penetrations for laboratory exhaust ductwork. The laboratory exhaust ductwork shall be wrapped in fire rated insulation or shall be constructed of a fire rated duct system when not routed in a rated duct shaft. Laboratory exhaust ductwork shall serve only one specific floor to maintain code required fire separation between each floor.
  3). Chemical hoods shall be constant volume bypass, variable volume or low flow constant volume hoods as appropriate for the application.
      a). Hoods will be provided by the laboratory contractor. The Mechanical Contractor shall connect the exhaust ductwork to the hood.
      b). Refer to laboratory equipment plans for fume hood locations, sizes and quantities.
  4). Exhaust fans shall be centrifugal, backward inclined, direct drive fans (100% redundancy) connected to a common plenum with automatic by-pass dampers and an energy recovery coil.
      a). Exhaust fan/energy recovery module, consisting of 4" foam filled double wall casing, stainless steel interior lining, inlet plenum, filter section, energy recovery coil, isolation/bypass dampers, outlet plenum and access doors.
      b). Three (3) exhaust fans per module at 9,000 cfm exhaust each. One (1) fan fully redundant.
      c). Fans to discharge to an exhaust stack, minimum 8 feet above the highest roof level or screen wall. Minimum discharge velocity of 3500 fpm.
      d). Fan control strategy will be evaluated to maximize efficiency while still maintaining minimum performance requirements.
  5). Dedicated exhaust valves shall be provided at each fume hood, biological safety cabinet and snorkel location. Exhaust valves to be low pressure drop type (minimum 0.30" w.c.).

6). Dedicated laboratory controls shall be provided for VAV type fume hoods or rooms with a high density of fume hoods and associated high air change rate. System to be integrated with the Building Automation System. Lower intensity air change rate rooms shall be controlled by the building DDC control system.

- Vivarium Exhaust
  1). The exhaust systems for the Animal Care area shall be separate from any other exhaust system.
  2). Exhaust fans shall be centrifugal, backward inclined, direct drive fans (100% redundancy) connected to a common plenum with automatic by-pass dampers.
    a). Three (3) exhaust fans at 9,000 cfm exhaust each. One (1) fan fully redundant.
  3). Fans to discharge to an exhaust stack, minimum 8 feet above the highest roof level or screen wall. Minimum discharge velocity of 3500 fpm.
  4). Energy recovery module consisting of 4" foam filled double wall casing, stainless steel interior lining, inlet plenum, filter section, energy recovery coil, isolation/bypass dampers, outlet plenum and access doors.
- Greenhouse Exhaust
  1). The exhaust systems for the Greenhouse area shall be separate from any other exhaust system.
  2). Exhaust fans shall be centrifugal, backward inclined, connected to a common exhaust plenum. Fans suitable for moist air service. Total fan exhaust of 9,000 cfm.
  3). Fans to discharge to an exhaust hood.
- Chiller Room Exhaust (serving heat recovery chiller)
  1). A dedicated exhaust fan shall be provided for the Chiller Room, connected to low exhaust inlets, where required by code.
  2). A refrigerant monitoring system shall be provided as required by code. The exhaust fan shall operate on refrigerant alarm.
  3). The associated air handling unit shall operate whenever the exhaust fan is in operation, or as required for space ventilation.
- Miscellaneous Exhaust Systems
  1). Separate exhaust systems will be provided for a number of specific applications in the facility which may include the following:
    a). Mechanical equipment room ventilation/exhaust.
    b). Electrical equipment room ventilation.
    c). Mechanical Penthouse ventilation/exhaust.
  2). Associated intake/transfer air fans with filter/mixing box, outside air and return air dampers will be provided to supply the appropriate amount of make-up ventilation air.
  3). Fans will be provided with a variable frequency drive to provide proper airflow and space differential pressure relative to adjacent occupied areas.
  4). The mechanical penthouse may be used as a relief air plenum to provide ventilation for the space when relief air is available.
- Emergency Generator Exhaust
  1). HVAC contractor shall install the emergency generator muffler and provide exhaust piping to outside the building where required. Exhaust termination to be located as required by AHJ. Piping to be insulated with calcium silicate insulation and aluminum jacket.

2). Air intake louvers, control dampers and intake air silencers will be provided for generator ventilation and combustion air. Louvers to be sized for minimal pressure drop per generator manufacturer recommendations.
3). An exhaust plenum with discharge air and recirculating air dampers will be provided for ventilation exhaust from the discharge of each generator.

- Other special exhaust systems will be provided, as necessary, due to hazard level, moisture content, or heat generation within the various spaces. To be confirmed as design progresses.

6.6.11 Dehumidification Systems

A. Dehumidification Units will be provided where conditions necessary at specific rooms/areas cannot be met with the central air handling systems (to be confirmed with Owner's special requirements).
B. Systems may consist of a desiccant wheel unit, liquid desiccant unit or booster cooling/reheat coils depending on specific requirements, design tolerances, available space, etc. and will be confirmed as the design progresses.

6.6.12 Common Equipment and Materials

A. Piping Systems
1. Steam & Condensate
a. Material
1). Carbon steel piping with threaded fittings for pipes 2" and smaller and welded fittings for pipes 2-1/2" and larger.
2). Steam piping will be Schedule 40; condensate piping will be Schedule 80.
3). Steam and condensate piping and fittings will be insulated with rigid glass fiber insulation.
b. Pipe Sizing
1). Steam piping (HPS mains) will be sized to maintain velocities between 6000 and 8000 fpm.
2). Steam piping for steam pressure equal to or less than 15 psi will be sized for a maximum pressure drop of 3/4 psi/100 feet of pipe and a maximum velocity of 6000 fpm.
3). Steam piping for steam pressure greater than 15 psi will be sized for a maximum pressure drop of 2 psi/100 feet of pipe and a maximum velocity of 8000 fpm.
4). Steam condensate piping will be sized as follows:
a). Maximum pressure drop of 4 ft. of water/100 ft. of piping for piping 1" and larger.
b). 2 fps minimum velocity to 8 fps maximum velocity.
c. Expansion Compensation
1). "L-bend", "U-bends" and "Z-bends" will be used for expansion compensation on the floors, space permitting.
2). Pre-fabricated expansion loops, similar to Metraflex Metraloops, may be utilized where space does not permit the use of hard loops.
3). Packed Slip type expansion joints will be used for expansion and contraction where space does not permit the use of bends or loops.

4). Prefabricated Anchors and Guides will be used whenever possible.
5). Sizing
a). Cold temperature = 50 ºF
b). Hot Temperature = actual fluid temp.

2. Chilled Water, Condenser and Glycol Systems
a. Material
1). Schedule 40 carbon steel piping with threaded fittings for pipes 2" and smaller and welded fittings for pipes 2-1/2" and larger.
2). Copper piping with soldered fittings or brazed with silver solder may be used for piping 2" and smaller.
b. Insulation
1). Chilled Water: Rigid Polyisocyanurate.
2). Cooling Coil Condensate: Closed Cell.
3). Condenser Water: Inside – Not required; Outside Rigid Fiberglass.
4). Glycol Water: Rigid fiberglass.
5). Insulation located outside shall be covered with a PVC or aluminum jacket.
c. Sizing
1). Chilled, Condenser and Glycol water piping will be sized as follows:
a). Maximum pressure drop of 4 ft. of water/100 ft. of piping for piping 1” and larger.
b). 2 fps minimum velocity to 10 fps maximum velocity.
3. Hot Water/Reclaim Water Systems
a. Material:
1). Type L copper piping with soldered fittings or brazed with silver solder, or carbon steel pipe with threaded fittings for pipes 2" and smaller.
2). Carbon steel piping with welded fittings for pipes 2-1/2" and larger.
b. Insulation: Rigid Fiberglass.
c. Sizing
1). Maximum pressure drop of 4 ft. of water/100 ft. of piping for piping 1” and larger.
2). 2 fps minimum velocity to 10 fps maximum velocity.

B. Ductwork
1. Material:
a. Supply Ductwork: Galvanized Sheetmetal.
b. Return Ductwork: Galvanized Sheetmetal.
c. Transfer Ductwork: Galvanized Sheetmetal.
d. General Exhaust: Galvanized Sheetmetal.
e. Laboratory Exhaust: PVC coated Sheetmetal or 316 Stainless Steel. All exposed exhaust and round branch ducts will be stainless steel, rectangular exhaust mains will be PVC coated steel.
f. Moisture Laden Exhaust
1). Aluminum or 304 Stainless Steel with soldered joints.
2). Exposed: 304 Stainless Steel, ground and polished.
2. Supply air ductwork will not be lined. Sound attenuating flexible duct up to 6 ft. in total length will be provided at the supply diffusers to help control noise.

3. Return air duct systems may be lined depending on sound criteria required for each system.
4. Ductwork will be constructed in accordance with SMACNA Standards for the appropriate pressure class.
5. Ductwork will be sealed to meet SMACNA Seal Class A as a minimum and to limit ductwork leakage not exceeding 1% of the design flow rate for high pressure ductwork and 2% for low pressure ductwork.
6. All Supply and Exhaust ductwork will be leak tested per SMACNA Standards.
7. Supply and exhaust ductwork will be designed in a looped system where appropriate, to allow greater flexibility for future changes.
8. Insulation
    a. Supply Ductwork
        1). Exposed above 12 feet: Flexible Fiberglass Wrap.
        2). Exposed below 12 feet: Rigid Fiberglass Board with Canvas covering.
    b. Concealed: Flexible Fiberglass Wrap.
    c. Return ductwork: Not required.
    d. General Exhaust from damper to outlet (roof or wall):
        1). Exposed above 12 feet: Flexible Fiberglass Wrap.
        2). Exposed below 12 feet: Rigid Fiberglass Board with Canvas covering.
        3). Concealed: Flexible Fiberglass Wrap.
    e. Laboratory Exhaust Ductwork: Not Required, except as noted from damper to outlet for General Exhaust. Laboratory ductwork to be enclosed in a dedicated rated shaft.
    f. Laboratory Exhaust (where not located in dedicated shaft): Fire rated insulation, similar to 3M Fire-master Fast/Wrap.
    g. Exterior Laboratory Exhaust Ductwork: Extruded polystyrene insulation for all ducts exposed to weather (does not include vertical exhaust stacks on discharge of exhaust fans).
9. Duct System Distribution Criteria
    a. Supply Ductwork Sizing
        1). From Air Handling Unit to Air terminal Units (ATU) Device:
            a). 0.10"/100 ft. when < 10,000 cfm.
            b). 1,800 fpm when > 10,000 cfm.
            c). Duct size to ATU device = ATU inlet size (within 10 ft. of ATU).
        2). Air Terminal Unit to Supply Diffuser
            a). 0.08"/100 ft. when < 8,000 cfm.
            b). 1,600 fpm when > 8,000 cfm.
    b. Return Ductwork Sizing
        1). From Return Grille to Return Air Terminal Units:
            a). 0.05"/100 ft. when < 8,000 cfm.
            b). 1,200 fpm when > 8,000 cfm.
        2). From Return Air Terminal Units to Return Fan:
            a). 0.10”/100 ft. when < 10,000 cfm.
            b). 1,800 fpm when > 10,000 cfm.
    c. Lab Exhaust Ductwork Sizing
        1). From Exhaust Grille to Exhaust Air Terminal Units:

a). 0.05"/100 ft. when < 8,000 cfm.
b). 1,200 fpm when > 8,000 cfm.

2). From Exhaust Air Terminal Units to Exhaust Fans:
a). 0.10”/100 ft. when < 10,000 cfm.
b). 1,800 fpm when > 10,000 cfm.

d. General Exhaust Ductwork Sizing
1) From Exhaust Grille to exhaust main:
a) 0.08"/100 ft. when < 8,000 cfm.
b) 1,600 fpm when > 8,000 cfm.
2) Exhaust mains in shafts and in Mechanical Rooms:
a) 0.10”/100 ft. when < 10,000 cfm.
d. 1,800 fpm when > 10,000 cfm.

C. Grilles and Diffusers
1. Supply Ceiling Diffusers: Aluminum, perforated type, similar to Titus model PSS.
2. Supply Linear Bar Grilles: Extruded Aluminum, similar to Titus Flowbar.
3. Supply Sidewall Diffusers: Aluminum, double deflection, ¾” blade spacing, similar to Titus Aero Blade.
4. Supply Radial/Laminar Flow Diffusers: Laboratory areas will be provided with aluminum, laminar or radial flow, perforated face supply grilles. Grilles will be provided with frames to allow installation of HEPA filter where appropriate. Epoxy coated grilles and diffusers will be provided where necessary for corrosion protection.
5. Return and Exhaust Ceiling & Sidewall grilles:
a. Aluminum, ¾” blades at 45º deflection, similar to Titus 3FL.
b. Laboratory areas will be provided with aluminum, louvered face return and exhaust grilles. Epoxy coated grilles will be provided where necessary for corrosion protection.

D. Air Terminal Units
1. Supply:
a. Single duct, dual wall with a solid sheet metal interior liner, with flow measuring station and low leakage dampers.
b. Galvanized sheetmetal construction with round inlet and square outlet.
c. Hot water coil 18” from damper with double wall, cam locking access panel upstream of reheat coil.
2. General Exhaust:
a. Galvanized sheetmetal construction with round inlet and outlet.
b. Removable flow sensor and round damper, or orifice plate.
3. Laboratory Make-Up Air, Fume Hood and General Exhaust:
a. Laboratory venture air control valve with low pressure drop, high speed of response, high accuracy and turndown.
b. Venturi air control valves serving fume hoods, sterilization rooms or other corrosive environments shall be constructed of stainless steel.
4. Zoning
a. In general each, room shall have an independent supply and return/exhaust air terminal unit.
b. Offices and other miscellaneous spaces may be combined onto a single box provided the rooms have similar functions, occupancy and exterior exposures.
1). No more than three (3) rooms will be combined on any one supply air terminal unit.

2). No more than five (5) rooms will be combined on any one return/exhaust air terminal unit.

5. Controls
   a. Each supply and return or exhaust air terminal unit will have DDC control.
      1). The return or exhaust air terminal unit shall track the supply airflow less any scheduled offset.
      2). Occupancy sensors provided under the Division 26 scope of work will be used for occupancy control of the HVAC terminal zone units.

E. Hot Water Terminal Units
1. Space heating shall be accomplished by the VAV box reheat coils and terminal hot water units.
2. Terminal hot water units shall consist of the following:
   a. Unit Heaters.
   b. Cabinet Heaters.
   c. Convectors.
   d. Radiant Ceiling Panels.
   e. Finned Pipe Radiation.
   f. Fan Coils (for both misc. heating and cooling).
3. Unit heaters shall be used in unfinished areas such as mechanical rooms, electrical rooms, loading dock, storage rooms, etc.
4. Cabinet Unit heaters shall be used in finished areas such as vestibules, stairways and lobbies.
5. Radiant Ceiling panels may be used in perimeter rooms with glass areas less than 30% than the wall area.
6. Finned pipe radiation shall be used for all rooms where the glass area exceeds 30% of the gross wall area.
7. Convectors may be used in toilet rooms which have a heat loss.
8. Radiant floor panels may be used at seating areas near main entries for comfort heating to offset infiltration losses. Depending on cooling load and airflow rates, radiant cooling may also be considered.
9. Sizing:
   a. All terminal equipment, except perimeter radiation and ceiling panels, shall be sized for a 20 ºF temperature drop or a minimum flow rate of 0.5 gpm.
   b. All radiation shall be sized for a 20ºF temperature drop or a minimum flow rate of 0.5 gpm.
   c. Equipment will be selected to provide capacity for 125% of the calculated load, except equipment for entry areas will be selected for 200% of the calculated load.
   d. Hot water equipment shall be selected for a 130 ºF entering water temperature.

6.6.13 Energy Recovery System

A. The following systems will be utilized as a source of energy recovery:
   1. A run around glycol loop system to recover energy from the central lab exhaust system for use in pre-heating and pre-cooling make-up air. System will consist of energy recovery coils in air handling units as well as coils in each of the exhaust fan energy recovery modules for Laboratory Exhaust, Animal Care Area Exhaust, and General Exhaust.
   2. Two circulating pumps (one of them standby) will distribute glycol to the run around coils. System shall consist of the following:
      - Two (2) end suction pumps, with suction diffusers and triple duty valves. Each pump will be selected for 100% of the design flow plus 10% additional flow for the by-pass filter.
      - A VFD for each pump shall be provided for capacity control.
      - An air eliminator and dirt separator with an automatic air elimination valve.
      - A sidestream filter system designed for 10% of the flow. The filter system shall be piped across the pumps from the supply to the return piping.
      - A bypass feeder to provide for chemical treatment
      - Bladder type expansion tank
      - Glycol fill tank with fill pump and connection to a non-potable water supply
      - Safety relief valve piped back to glycol fill tank

      The energy recovery system pumps will be on the emergency power system.

6.6.14 Temperature Controls

A. The building will be equipped with a Building Automation System for control and monitoring of the HVAC system and all critical Electrical, Plumbing, medical gas and fire protection systems. System will be integrated with the campus facility management system.
B. Field control devices (valve and damper actuators, etc.) shall be direct digital control with electric actuation.
C. Standalone terminal units (cabinet unit heaters, unit heaters) shall have electronic control.
D. System to include a complete graphics package with system schematics and floor plans locating each major piece of equipment controlled.
E. An existing HTML based interface will be used to communicate with the campus DDC Building Automation System.
F. The BAS will also provide monitoring and alarm of critical parameters for laboratory equipment and other critical conditions.
G. The following systems and equipment will be integrated into the Building Automation System:
   1. Emergency Generator.
   2. Automatic Transfer Switches.
   3. Power Monitoring.
   4. Site Lighting.
   5. Heat Recovery Chiller.
   6. Variable Frequency Drives.
   7. HVAC equipment not directly controlled by the BAS.

6.6.15 Life Safety

A. Smoke detectors (and dampers where required by code) will be provided at air handling units for unit shutdown/isolation upon signal from fire alarm system. Smoke detectors will be provided by the Electrical Contractor.

B. Fire and smoke dampers will be provided at rated construction to meet applicable code requirements. Smoke detectors will be provided by the Electrical Contractor at each smoke or fire/smoke damper.

6.6.16 Area Specific Requirements

A. Outside Air Intakes:
   1. Outside air intake locations to be coordinated with sources of contamination (emergency generator stack, plumbing vents, exhaust outlets, etc.) and prevailing winds to help eliminate outdoor air quality issues.
   2. Provisions will be made to protect air intakes to help prevent snow penetration into the air handling unit. This will consist of a double louvered wall approach similar to that utilized in the phase one building.

B. Lab and Vivarium Spaces:
   1. Room pressure monitors shall be provided at Lab areas as appropriate.
   2. Specific rooms shall be provided with a booster cooling coil for individual room temperature control as appropriate.
   3. Specific rooms shall be provided with a booster humidifier as appropriate. Booster humidifiers shall be steam type as noted in the Air Handling System description.
   4. Specific rooms shall be provided with a chilled water loop from the central system to serve room equipment requirements.
   5. Lab supply and exhaust duct mains will be sized for future flexibility.
   6. Lab Exhaust Devices:
      - Canopy Hoods: Hoods over work areas or equipment, used to capture heat or steam.
      - Snorkels: Small point of source capturing hood, attached to an adjustable exhaust arm, to capture heat or fumes from equipment or processes.
      - Vented Cabinets: Vented Cabinets used to store hazardous, corrosive, or flammable materials. Storage cabinets may be connected to an exhaust system, providing a negative pressurization inside the cabinets. Venting of flammable storage cabinets should be reviewed with the Authority Having Jurisdiction.
      - Down draft units: Bench top/table exhaust through top of work surface.
      - Equipment Vent Connections: Exhaust ductwork will be provided for equipment requiring a direct exhaust connection.
   7. Lab ventilation system types shall follow DFDM Design Guidelines, with the following general parameters:
      - Maximum air change rate = 12 ach: Constant volume.
      - Maximum air change rate = 12-24 ach: Two-position, or Variable Volume where appropriate.
      - Maximum air change rate > 24 ach: Variable volume.

- System types noted above will utilize an unoccupied setback control strategy for reduced airflow rates.
- A room level payback analysis will be performed to confirm the appropriate lab ventilation control strategy.

8. Lab control systems shall utilize fume hood sash position end switches and room photocell units.
   - When any fume sash is open or when the photocell senses the appropriate light level for an occupied condition, the room will be controlled to Occupied airflow rates.
   - The system will reduce airflows to Unoccupied airflow rates when all fume sashes are closed and the photocell senses a light level indicative of an unoccupied condition.
   - Each fume hood will be provided with a local monitoring device to confirm proper operating conditions, and alarm (visual and audible) upon unsafe conditions.

C. Dust Collection: A dust collection system shall be provided to serve the shop equipment (table saw, drill press).

6.6.17 Emergency/Standby Power Provisions

A. Emergency power should be provided to serve the following loads:
   1. Heating equipment and associated system pumps.
   2. Heat recovery chiller, associated equipment and system pumps.
   3. Laboratory and Vivarium exhaust fans and associated make-up air handling units.
   4. Energy recovery equipment and associated system pumps.

B. The temperature control system and all components will be served from an uninterruptible power source (provided as part of the temperature control system).

6.6.18 Commissioning

A. All major systems (air handling units, steam, hot water, chilled water, etc.) as well as life safety systems will be commissioned.

B. The appropriate contractor will be expected to verify the equipment installed meets all performance requirements, as well as to address and remedy any issues discovered during the commissioning process.

C. Commissioning work to be performed by the Mechanical Contractor shall include, but not be limited to:
   1. Start-up and testing of equipment.
   2. Performing commissioning tests, including seasonal tests.
   3. Providing appropriate commissioning documentation.
   4. Attendance at Commissioning meetings.

6.7 Electrical Systems

6.7.1 Project Goals

Sustainable Design

The project is intended to be designed to version 2.0 of the Division of Facilities Development Sustainable Facilities Standard.

Design Prerequisites and Credits which will directly affect the Electrical design include:

- SS Credit 8 – Light Pollution Reduction
- EA Credit 1 – Optimize Energy Performance
- EA Credit 5 – Measurement and Verification
- EA Credit 6 – Green Power

6.7.2 Applicable Codes, Guidelines, and Standards

The codes and standards listed below are considered to provide the minimum design requirements necessary. Actual design parameters may exceed these requirements where appropriate.

The currently adopted codes and most recent editions of the following referenced standards shall apply.

- DSPS Wisconsin Department of Safety and Professional Services
- IEEE Institute of Electrical and Electronics Engineers
- IESNA Illuminating Engineering Society of North America
- NEC National Electrical Code as adopted in Wisconsin
- NECA National Electrical Contractors Association
- NEMA National Electrical Manufacturers Association
- UL Underwriters Laboratories
- NFPA 1, 70, 72, 99, 101, 780
- ADAAG Americans with Disabilities Act Accessibility Guidelines
- ADA Americans with Disabilities Act
- DFD Department of Facilities Development Guidelines
- DFD Guidelines/Standards for Design and Sustainability
- TIA Telecommunications Industry Association
- ICC International Code Council (ICC)
    - International Building Code, Occupancy Classification: "B" Business
    - International Energy Conservation Code
    - International Electrical Code
    - International Fire Code

6.7.3 Base Design Criteria

Load Calculation Criteria:
Maximum Design Connected Watts Per Square Foot

Room Type	Lighting	Receptacle
Active Storage	.7	.5
Classroom/Lecture	.86	4.0
Conference/Meeting	.86	4.0
Corridor	.46	.5
Electrical/Mechanical Rooms	.67	Actual Equipment Loads
Laboratory	.90	4.0
Office, Enclosed	.78	4.0
Office, Open	.67	4.0
Reception Area/Lobby	.63	1.0
Restrooms	.69	.5
Stairway	.48	.5
Egress Lighting	.20	

Equipment Sizing Criteria:

Item	Description
Secondary Design Voltages	
Motors	480V, 3 phase, 3 wire
General Lighting	277V, 1 phase, 2 wire
Receptacles Motors less than ½ hp Specialty Lighting	120V, 1 phase, 2 wire
Equipment Sizing Criteria	
Branch Circuit Load Calculations	
Lighting	Actual Installed VA
General Purpose Receptacles	180VA per outlet
Multiple Outlet Assemblies	180VA per 2'-0"
Special Outlets	Actual Installed VA of Equipment Served
Motors	100% of Motor Full Load Amps
Demand Factors – Commercial Areas	
Lighting	100% of Installed VA
Receptacles	100% of First 10 kVa Installed plus 50% of Balance
Motors	100% of Total Motor Full Load Amps

Dedicated Receptacles	100% of Total VA and Fixed Equipment Installed
Demand Factors – Residential Areas	
Calculate load for residential areas as indicated in the National Electric Code	
Minimum Bus Sizes	
480Y/277V Equipment/Lighting Panels	100A
208Y/120V Equipment Panels	100A
208Y/120V General Receptacle Panels	100A

6.7.4 Normal Power Service and Distribution

System Description – Site / 4.16 kV

- The existing Cowley facility is served from existing pad mount switchgear on grade on the South side of the facility. This switchgear is fed from existing Feeders #5 and #6 in existing manhole P28, and feeds Cowley East and West Substations.
- For demolition of Cowley, reconfigure loop system to isolate Cowley and remove pad mount switchgear and feeders to Cowley.
- For new building, intercept existing Feeders #5 and #6 in existing manhole P28 and extend to new medium voltage switchgear via new ductbank from P28.
- Provide new combined power / signal ductbank between P28 / S28 and building Basement main equipment rooms.
    - Provide new 2x2, 5"C, ductbank between P28 and Main Electrical Room.
    - Provide new 2x2, 4"C, ductbank between S28 and telecommunications Main Equipment Room.
- Provide and new 5 kV lineup in Medium Voltage Electrical Room, Basement. Lineup shall consist of two (2) loop switches and one (1) fusible switch to serve the new Science Building.
- Provide a dry-type transformer in the Main Low-Voltage Normal Power Electrical Room to serve the building switchboard. Primary voltage shall be at 4,160V, 3-phase and secondary voltage 480Y/277V, 3-phase, 4-wire power. The estimated capacity of the transformer is 2000 kVA.

System Description – 480V

- Main Switchboard
    - Provide a new 3000A, 480Y/277V, 3P, 4W single-ended switchboard in a new Main Low-Voltage Normal Power Electrical Room located in the Basement. Switchboard shall have a solid state main circuit breaker and solid state circuit breakers for distribution breakers sizes 250A and above. Switchboard shall have (2) levels of Ground Fault, the main circuit breaker and any circuit breakers over 250A.
    - Main Switchboard shall feed transformers, automatic transfer switches, motor control centers, distribution panelboards, and branch circuit panelboards.
    - A Surge Protective Device (SPD) shall be provided on the Main Switchboard to protect against transient voltage caused by external sources. SPD equipment shall be located next to the switchboard being protected.
- Branch Electrical Rooms

  - Electrical equipment rooms shall stack vertically to allow electrical conduit feeders to be easily routed from main switchgear to each room. A single electrical room shall be located centrally on each floor.
  - Electrical rooms on floors shall include 480Y/277V lighting panelboards. Each electrical room shall also contain fire alarm control equipment and provide space for lighting control panels.
- Provide panelboards within mechanical spaces and Penthouse(s) as required.

System Description - 208V

- Step-down transformers and 208Y/120V branch panelboards shall be provided in the each floor electrical room to serve loads. Estimated 208V transformer sizing is 150 kVA with associated power distribution panels to serve floor branch panelboards.
- Panelboards shall be provided locally to serve each large laboratory or group of small laboratories.
- Panelboards serving office areas shall be located in a local electrical closet, typically one closet on each East and West Wing.

Equipment and Material

- Switchboards shall be front access only, deadfront construction utilizing molded case circuit breakers and copper bus bars. All switchboards shall be fully rated for the available short circuit current. All equipment shall be provided with copper ground busses. The capacity of the equipment shall be sufficient for an additional 10% future connected load.
- A Surge Protective Device (SPD) shall be provided on each main. SPD equipment shall be located next to switchboard being protected.
- Power distribution panelboards shall be deadfront construction utilizing thermal magnetic circuit breakers and copper bus bars. All panels shall be fully rated for the available short circuit current. All trims shall be door-in-door type. All panels shall be provided with copper ground busses. The capacity of the panels shall be sufficient for an additional 10% future connected load. Feeder circuit breaker space shall be provided for the addition of 10% future circuit breakers.
- Branch circuit and lighting panelboards shall be deadfront construction utilizing thermal magnetic circuit breakers and copper bus bars. All panels shall be fully rated for the available short circuit current. All trims shall be door-in-door type. The panelboard connected load shall be limited to provide an additional 10% future connected load. The panelboards shall contain 10% spare 20A branch circuit breakers, and space for the addition of 10% future circuit breakers.
- Step down transformers shall be metal enclosed, energy efficient, dry-type with aluminum windings and 150°C rise.
- Point-of-use power connection devices shall include power receptacles, furniture connections, and other equipment connections as required.

Distribution

- Raceway for feeders and branch circuits less than 600V shall be metallic, electrical metallic tubing (EMT) subject to the restrictions of the National Electrical Code, minimum size 1/2". EMT shall not be used in concrete construction or where subjected to mechanical damage.
- 600-volt feeders shall be single-conductor, aluminum or copper 600-volt rated with XHHW, XHHW-2, or THHW insulation, feeders shall be color coded using color type at all connections and in all pull and junction boxes.

- Aluminum feeder conductors shall be allowed per DFD Guidelines. Only where compression termination can be used. No mechanical lugs shall be accepted. All distribution equipment enclosures shall be sized to accommodate these compression lugs. If compression lugs cannot be used, then copper conductors are only allowed.
- All feeders shall be installed in conduit.
- Branch circuit conductors shall be single-conductor copper 600-volt rated with THWN or THHN insulation with continuous color-coding. Branch circuits shall utilize dedicated neutrals.

6.7.5 Emergency Service and Distribution

System Description

- The emergency service shall be derived from (2) paralleled 400kW / 500kVA, 480Y/277V natural gas generators. The generator shall be sized to serve the loads requiring emergency power. Generator shall serve an Emergency branch (NEC Article 700 loads), a Legally Required (NEC Article 701 loads) and a Standby branch (NEC Article 702 loads).
- Article 700 / Emergency branch loads include:
  - Emergency egress lighting
  - Exit signs
  - Fire alarm system
  - Sprinkler bell
  - Generator loads
    - Battery charger
    - Blanket heater
- Article 701 / Legally Required loads include:
  - Elevators (sized to accommodate one active elevator only)
  - Fire Pump
- Article 702 / Standby branch loads include:
  - Security system
    - Control panel
    - Door power supplies
    - Delayed egress doors
    - Camera power supplies and heaters
    - Door hold-opens
  - HVAC
    - Temperature control system
    - Hot water heating pumps
    - Condensate pumps
    - Heat recovery chiller
    - Lab exhaust fans
    - Make-up air fans
  - Small coolers and freezers
  - MER / TR rooms
  - Lighting in electrical rooms with emergency distribution equipment
- Generators (EPS) shall be located interior in Basement Generator Room.
- Transfer switches (EPSS) and associated emergency distribution equipment shall be located in an Emergency Electrical Equipment Room adjacent to the Generator Room.

- See Normal Power System description for additional panelboard requirements within specific rooms.

- Equipment and Material
  - Automatic transfer switches (ATS) shall be used to couple the generator power to the normal distribution system. The ATS shall be open-transition, non-bypass-isolation type.
  - A Surge Protective Device (SPD) shall be provided on each emergency power distribution panel to protect against transient voltage caused by transfer switch operation. SPD equipment shall be located next to the distribution panel being protected.
  - See normal power system description for additional information on equipment construction.
- Distribution
  - The entire emergency power distribution system shall consist of conduit and wire. See normal power system description for additional information.
  - Feeders and branch circuit wiring to emergency loads shall be in a dedicated raceway for each branch of the emergency system.

6.7.6 Grounding System

System Description

- A complete equipment grounding system shall be provided such that all metallic structures, enclosures, raceways, junction boxes, outlet boxes, cabinets, machine frames, and all other conductive items operate continuously at ground potential and provide a low impedance path to ground for possible fault currents. All grounding system connections shall be made using compression, mechanical or exothermic welds.
- Bonding jumpers shall be provided as required across pipe connections to water meters, dielectric couplings in a metallic cold water system, and across expansion/deflection couplings in conduit and piping systems.
- A separate insulated green grounding conductor shall be provided for each single and 3-phase feeder and branch circuit. Grounding conductor shall be run with the related phase and neutral conductors. Panel feeders installed in more than (1) raceway shall have individual, full sized, green grounding conductor in each raceway. The equipment grounding system shall not rely on the metallic raceways for grounding continuity.
- Additional telecommunications grounding requirements as discussed in “Voice / Data Systems” section (below).

Equipment and Material

- Provide a wall-mounted copper ground bar around perimeter of Main Electrical Room. Connect bus to the exterior ground ring in two locations.
- Provide 5/8" x 10' driven copper ground rods within the Main Electrical Room. Connect to the ground bar with a #4/0 AWG bare copper conductor.

Distribution

- Provide a 24” ground bar in each new electrical room. A separate, insulated #4/0 AWG ground wire shall be provided from the main electrical room ground bus to each floor's electrical room ground bus.

- The main service entrance neutral shall be bonded to the system ground bar within the switchboard by a removable bus bar link.
- A code-sized, unbroken bond leader shall connect the electrical room ground bar to the XO terminal of local transformers.
- A bare copper, grounding electrode conductor shall be extended to all voice/data room ground bars.

6.7.7 Lightning Protection System – Franklin System

System Description

- Provide a UL master labeled class II lightning protection system consisting of dedicated lightning protection ground rods, down conductors, air terminals, and all interconnecting conductors in the building.

Design Criteria

- Lightning protection system shall be installed in compliance with NFPA 780 – Installation of Lightning Protection Systems.

Ground Ring

- Provide a ground ring electrode system around the perimeter of the building as part of the lightning protection system.
- Provide least one dedicated ground rod per down conductor.
- The lightning protection system shall be bonded to each main electrical room ground bar at a minimum of two locations each.
- Where possible, connect steel columns in exterior walls to ground ring with #4/0 AWG bare copper.

Air Terminals

- Provide blunt tip air terminals spaced a maximum of 20’ apart along the perimeter of the protected structure.
- Provide intermediate air terminals with air terminal point protectors and spring mounted bases to protect flat sections of roof.
- Interconnect all metal protrusions through roof, including exhaust fans, ductwork/AHUs, and plumbing vents.

Down Conductors

- Provide a minimum of two down conductors. Provide additional down conductors such that the distance following the perimeter of the building does not exceed 100’ between down conductors.
- Provide concealed, continuous down conductors installed in schedule 40 PVC conduit through the interior of the building; do not mount to exterior of building.

Equipment and Material

- All equipment shall be copper, and equivalent to class II products manufactured by National Lightning Protection or equal.

6.7.8 Lighting Systems:

System Description

- All new lighting shall be hung from the building structure independently of ceiling support system including all grid mounted fixtures. All lighting fixtures shall be complete with LEDs, drivers, hangers, lenses, etc.

- Lighting shall be 277V solid-state LED. Incandescent lighting shall not be used.

- Examples of light fixtures to establish quality shall be as follows:
  - Laboratory
    - Pendant mounted high efficiency linear LED direct / indirect fixtures. Equal to Pinnacle EX3B.
    - 2'x2' recessed direct architectural fixture with volumetric distribution. Equal to Focal Point Equation LED.
  - Clean Rooms
    - 2'x4' recessed clean room fixtures with ISO6 (class 1000) rating. Equal to Kenall M4SEDI24.
  - Conference Rooms, Private Offices, Corridors
    - Wall mounted high efficiency linear LED direct / indirect fixtures where no ceilings are present. Equal to Amerlux Linea 1.5.
    - Recessed mounted high efficiency linear LED recessed fixtures where ceilings are present. Equal to Pinnacle E2A.
    - 7" square downlight where ceilings are present. Equal to Focal Point Id LED.
  - Vestibule
    - 7" square downlight where ceilings are present. Equal to Focal Point Id LED.
  - Lobby
    - Perimeter slot fixture. Equal to Prudential P43.
    - 7" square downlight where ceilings are present. Equal to Focal Point Id LED.
    - Decorative lighting to be determined.
    -
  - Restrooms
    - Sinks – Recessed mounted high efficiency linear LED recessed fixtures above vanity and at sides of mirror. Equal to Pinnacle E2A.
    - Stalls - Recessed perimeter slot fixture against wall, length of stalls. Equal to Prudential P43.
    - Center of ceiling - 7" square downlight. Equal to Focal Point Id LED.
  - Utility Spaces
    - Lensed type LED recessed fixtures where a ceiling is present and industrial type LED suspended fixtures where a ceiling is not present.

- Egress lighting and exit signs will be provided along the entire path of egress.
  Egress lighting and exit signs will be served by the Article 700 Emergency branch of emergency power supplied by building generator.

- All lighting levels shall conform with the Illuminating Engineering Society's recommendations and in general, shall be as follows in footcandles (FC). Actual ambient levels may be adjusted due to power density considerations and supplemented with task lighting. This shall be determined as the project progresses and surface finishes are selected.
    - Support areas (toilet, corridor, stair, storage, mechanical / electrical room): 15 to 20 FC
    - Office: 30 FC with task lighting
    - Meeting / Conference rooms: 30 FC
    - Laboratory at desk height: 40 FC
    - Laboratory at bench height: 50 FC
    - Support areas (restroom, corridor, stair, storage, mechanical/electrical room): 15 FC
    - Lobby / Foyer: 10 FC
    - Loading Dock: 20.0 FC average, 50 FC at entrance ramp only.
    - Exterior Pedestrian Walkways: 0.5 to 1.0 FC
    - Egress lighting: 1.0 FC average per code

- Controls shall be provided as follows:
    - All areas shall be provided with ceiling-mounted occupancy sensors to automatically control lighting. Sensor shall be provided as follows:
        - Janitor's closets, small storage rooms, single occupant toilet rooms: Wall mounted infrared.
        - Multi-occupant restrooms: Ceiling mounted dual technology infrared / ultrasonic.
        - Large storage rooms: Ceiling mounted infrared.
        - Individual office, corridors, lobbies: Ceiling-mounted dual technology infrared / ultrasonic.
        - All ceiling mounted occupancy sensors shall be provided with auxiliary relay packs capable of interfacing with the HVAC for system setback.
        - All rooms with occupancy sensors shall have manual override to positively shutoff light fixtures as needed.
    - Perimeter areas, fifteen feet from windows, shall be controlled separately.
    - Local 0-10V dimming shall be provided in work, classroom, lab, and office areas to allow occupant selection of lighting levels.
    - Mechanical and electrical rooms shall be controlled via line voltage switches for safety.
    - Any large conference rooms with central A/V control systems shall utilize a dimming system interfaced with the Audio / Visual systems. The dimmer systems shall have the following characteristics:
        - Systems shall be equivalent to the Wattstopper DLM series. The lighting shall be capable of control through dimming stations and Audio / Visual systems.
        - A master control station shall be provide for each room and partitioned area for manual control of rooms if Audio / Visual system is not available.
        - Scene recall control stations shall be provided at each room entrance.
        - Meeting rooms with partitions shall have partition control buttons to merge control of lighting zones if partitions are open.

- Sustainability
    - Lighting densities will be a minimum of 30% lower than required by ASHRAE 2010.
    - Daylighting controls will be utilized where possible to reduce operating costs.

6.7.9 Site Electrical Requirements:

Exterior Lighting

- Walkways shall be illuminated with campus standard acorn type post top LED fixtures to provide IES recommended light levels. The fixtures shall be classified as cut-off luminaries, and shall be mounted at or below heights allowable by local codes.
- Canopies. Lighting under entrance canopies shall consist of LED downlight or wall sconce fixtures.
- Exterior Architectural Building Lighting. Some exterior LED lighting fixtures shall be used to highlight as yet undetermined architectural features.
- All exterior lighting shall be controlled via a discrete relay system. All lighting shall be turned on and off by the campus central system signal.
- Life Safety circuits shall be provided to LED lamped fixtures illuminating the code required path between the exit discharge and the public way. The remainder of the site lighting shall be wired to a combination of normal and critical branch lighting circuits.

Exterior Power

- Building mounted exterior, weatherproof, GFCI receptacles shall be mounted around the perimeter of the building at each exit door, and no more than 100' on center.
- Provide power to any internally lit signage and / or exterior illuminated building signage.
- Provide power general power and illumination to serve outdoor mechanical equipment.

6.7.10 Fire Alarm System

System Description

- A new Simplex 4100ES monitored, multiplexed, fully addressable one-way voice fire alarm system control panel shall be provided in the building. The fire alarm system shall be composed of smoke detectors, heat detectors, magnetic door holders, duct smoke detectors, manual pull stations, water flow monitors, tamper switches, and audio/visual signaling devices. All devices in project shall be new.
- The installation of new devices shall comply with DFD standards.
- System shall be integrated into UW LaCrosse Campus Mass Notification system. Cross connect to system shall occur in Wing Hall.
- System shall also be integrated into the existing Simplex 4100ES fire alarm system in the Phase 1 Science Building via fiber optic connection.

Design Criteria

- The fire alarm system shall comply with requirements of NFPA 72, Life Safety Codes and State Building Code.
- A fire alarm annunciator panel shall be mounted at the entrance as designated by the local fire department.
- Audio/visual devices shall be installed in all areas of the building in accordance with the NFPA and ADA guidelines. All areas of the building shall be covered by audible device coverage as required by NFPA 72 and the International Building Code as adopted in Wisconsin. Visual devices shall be installed in those public and common areas as recognized by ADA such as corridors, bathrooms, kitchen, serveries, dining rooms, conference rooms, waiting rooms, break areas and lobbies. Visual devices shall also be provided in mechanical areas as a supplement to the audible devices.

- Smoke detectors shall be installed as required by the National Fire Protection Association and the International Building Code. Smoke detectors shall be installed in, but not limited to, the following locations: air handling units, elevator shafts, elevator lobbies, elevator machine rooms, and electrical equipment rooms.
- Heat detectors shall be installed in areas that are not suitable for smoke detectors.
- Dual-action manual pull stations shall be installed adjacent to all exit doors, each elevator lobby, and at floor exit stairwells. Pull stations shall have covers.
- Fire fighter phones shall be installed in each elevator lobby.

Equipment and Material

- Remote transponder panels shall be used to provide supervised amplifiers and signal circuits for audio/visual devices and magnetic door holders.
- The system shall utilize individual addressable, photoelectric smoke detectors, heat detectors, addressable manual pull stations, and addressable monitor and control modules. The system shall monitor all sprinkler supervisory and water flow switches and shall interface with elevators, HVAC smoke control, and smoke fire dampers.

6.8 Information Technology Systems

Definitions

- Backbone Cabling – A facility (e.g., pathway, cable, conductors) between any of the following spaces: Telecommunications Rooms (TR), Telecommunications Enclosures (TE), common Telecommunications Rooms, floor serving terminals, Entrance Facilities (EF), Equipment Rooms (ER) and, common equipment rooms.
- Cable – An assembly of one or more insulated conductors or optical fibers, within an enveloping sheath.
- Cable Channel – The end to end transmission path connecting interfaces on any two pieces of application specific equipment. Equipment cords and work area cords are included in the channel.
- Cable Link – A transmission path between two points no including terminal equipment, work area cables, and equipment cables. Can be up to 90m (295ft.) in length for horizontal cabling.
- Consolidation Point (CP) – A location for interconnection between horizontal cables extending from building pathways and horizontal cables extending into furniture pathways.
- Cross-Connection – A connection scheme between cabling runs, subsystems, and equipment using patch cords, or jumpers that attach to connecting hardware on each end.
- Entrance Facility (EF) – An entrance to a building for both public and private network service cables (Including wireless) including the entrance point at the building wall and continuing to the entrance room or space.
- Faceplate – A protective plate surrounding a communications outlet that is used to hold telecommunications outlets/connectors or transition devices.
- Horizontal Cabling – Distribution media that connect the telecommunications outlet/connector at the work area and the first piece of the connection hardware in the horizontal cross connect (floor distributor).
- Inter-Building – Connections between more than one building.
- Intra-Building – Connections within a single building, can be multiple floors
- Jack – A common term for telecommunications outlet/connector. Referred to as a modular jack and a Standard Information Outlet (SIO).
- Local Area Network (LAN) – The standard industry term for a network installation that serves a relatively small area (e.g., structured cabling installation serving a building).
- Main Equipment Room (MER), The central telecommunications space in a building, which connects to the TR(s) and to the EF. The MC is housed in this space, and the room may also serve as the HC for the floor or area in which it is located. Often the core data switch is located here.
- Main Cross-connect (MC), The cross-connect normally located in the (Main) equipment room for cross-connection and interconnection of entrance cables, first level backbone cables, and equipment cables. Campus distributor is the international equivalent term for the Main Cross-Connect.
- Outlet – A metallic or nonmetallic box mounted with a floor, wall or ceiling and used to hold telecommunications outlets/connectors or transition device.
- Standard Information Outlet (SIO) – an outlet jack device located in the work area on which horizontal cabling terminates.
- Telecommunications – Any transmission, emission and reception of signs, signals, writings, images, and sounds; that is, information of any nature by cable, radio, optical, or other electromagnetic systems.

- Telecommunications Room (TR), An enclosed architectural space for housing telecommunications equipment, cable terminations, and cross-connect cabling.
- Unshielded Twisted Pair (UTP) – Balance, 4-pair cable used for copper horizontal cabling and multi-pair copper backbone cables.
- Voice over Internet Protocol (VoIP) – A system in which voice signals are converted to packets and transmitted over a network using Transmission Control Protocol/Internet Protocol (TCP/IP)
- Wide Area Network (WAN) – A data communications system that uses telecommunications circuits to link LANs that are distributed over large geographic distances. Typically includes client-owned and service provider-owned cabling and equipment.

Applicable Codes, Guidelines, and Standards

The technology systems shall be designed in accordance with the following codes, guidelines, and standards:

- Wisconsin Enrolled Commercial Building Code, which consists of the International Building Code (IBC) with the State of Wisconsin amendments.
- National Fire Protection Association (NFPA) guidelines and standards including the following:
    - NFPA 70 – National Electrical Code, with the State or Wisconsin amendments
    - NFPA 72 – National Fire Alarm Code
    - NFPA 101 – Life Safety Code
- ANSI/TIA-568-C.0 Generic Telecommunications Cabling for Customer Premises
- ANSI/TIA-568-C.1 Commercial Building Telecommunications Cabling
- ANSI/TIA-568-C.2 Balance Twisted-Pair Telecommunications Cabling and Components
- ANSI/TIA-568-C.3 Optical Fiber Cabling Components
- ANSI/TIA-568-C.4 Broadband Coaxial Cabling and Components
- ANSI/TIA-569-C Commercial Building Standard for Telecommunications Pathways and Spaces
- ANSI/TIA-606-B Administration Standard for Commercial Telecommunications Infrastructure
- ANSI-J-STD-607-B Commercial Building Grounding and Bonding Requirements for Telecommunications.
- ANSI/TIA/EIA 526-14-B – OFSTP-14 Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant.
- IEEE/ANSI 142-1982 Recommended Practice for Grounding of Industrial and Commercial Power Systems.
- UL 910 – Test for Flame Propagation and Smoke Density Values for Electrical and Optical Fiber Cables used in Spaces Transporting Environmental Air
- UL 1660 Test for Flame Propagation Height of Electrical and Optical Fiber Cables Installed Vertically in Shafts.
- ICEA Publication S-80-576-2002.
- BICSI TDMM Telecommunications Distribution Methods Manual (Current Edition).
- Department of Facilities Development Guidelines
- DFD Guidelines/Standards for Design and Sustainability

Low Voltage Raceway Systems

System Description

- Low Voltage Vertical Riser – Telecommunications Equipment Rooms will be vertically stacked. Provide 4" conduit sleeves interconnecting horizontal cable pathways or between Telecommunication Equipment Rooms. These riser sleeves shall be utilized for Backbone Copper, Backbone Optical Fiber, and miscellaneous systems cabling. Typically, these riser systems include a no less than (4) 4" Conduits, on lower floors and a reduced amount on upper floors. Sizing is based on number of systems, number of Telecommunication Equipment Rooms, size of the facility, need for physical redundancy, and the Owner's requirements for Backbone Cabling.
- Horizontal Distribution: Provide basket type cable tray routed above all major corridors. This cable tray is intended to route all low voltage systems not installed completely in conduit. These systems may include:
    - Voice/Data Horizontal Category 6 Cabling
    - Wireless Access Point (WLAN) Cabling
    - Copper Backbone Cabling
    - Optical Fiber Backbone Cabling
    - Security CCTV, Access Control, Intrusion Detection, and Duress System Cabling
    - Distributed Antenna Cabling (DAS)
    - Building Automation Systems
- Low Voltage Cable Distribution – Special Systems: Provide a recessed junction box sized to accommodate device within the wall at the outlet location and a 1" conduit routed from the junction box stubbed to the nearest accessible ceiling space. J-hooks shall be utilized above the accessible ceiling from the 1" conduit every 4' or less to support cabling to the cable tray.
- Low Voltage Cable Distribution – Horizontal Voice/Data: Provide a flush two-gang box with a single-gang plaster ring within the wall at outlet location and a 1" conduit routed from the box stubbed above the accessible ceiling. J-hooks shall be utilized above the accessible ceiling from the 1" conduit every 4' or less to support cabling to the cable tray.
- J-Hook cable support shall be utilized to transition cabling from the stubbed up outlet locations as well as between sections of cable tray in the ceiling where MEP congestion in the ceiling does not allow for the installation of a continuous length of cable tray. This latter option shall only be used as a last resort when no other option exists.
- Equipment and Material
    - Conduit Stubs: 1" EMT Conduit shall be used with plastic end bushings to protect cabling.
    - Conduit Sleeves: 4" EMT Conduit shall be used with plastic end bushings to protect cabling.
    - J-Hooks: Equivalent to Caddy or B-Line, Minimum ¾" (CAT12) and Maximum 4" (CAT64).
    - Cable Tray: Equivalent to Cablofil, B-Line or Chatsworth clear finish.
        - Cable tray in corridors: Combination of 24"W x 4"D and 18"W x 4"D.
        - Cable tray within Telecommunications Equipment Rooms: 12"Wx4"D and 18"W x 4"D

Telecommunications Structured Cabling System

Main Equipment Room (MER)/Entrance Facility (EF)/Telecommunication Room (TR):

MER will also include the incoming telecommunications services – or EF – as well as provide horizontal crossconnect for the lower level.

- A single MER shall be located in the lower level of the building.
- Suggested minimum room Size: 20ft. x 15ft.

The TR will house the horizontal cross-connect and edge data switch hardware.

- There will be (4) TR's in the new building – one on each of the upper floors.

MER/EF & TR Room Design Requirements

- The MER and TR(s) should be located as necessary to limit the longest network cable run to 295ft.
- The room walls shall be finished with drywall (Completely taped, sanded, and painted) or concrete block (painted) prior to mounting the plywood. All walls should be installed "deck to deck" and sealed as required by applicable building code.
- Walls in these rooms shall be lined with AC grade ¾" Plywood 8ft. high, painted with two coats of fire retardant paint on all 6 sides, leaving at least one plywood fire rating stamp visible on each sheet for future reference.
- Each room doorway should be a minimum of 3'-0" in width x 6'8" in height. All doors should swing out if possible to maximize usable room space. Each room shall be provided with card access control with keyed override.
- These rooms should not be placed so it is boxed in by restrooms, mechanical rooms, pipe chases, elevator shafts, stairways, or high voltage electrical rooms. These rooms should be placed so each is accessible from a hallway or open space for easy access.
- Rooms should be stacked (aligned vertically) in multi-floor buildings.
- A wall mounted telephone outlet shall be provided in each room. Phone to be provided by the Owner.
- Specified distances should be maintained from possible sources of electromagnetic interference (EMI) exceeding 5 kilovolt-amperes (kVA)
    - 24in. - From unshielded power lines or electrical equipment in proximity to open or non-metal pathways.
    - 12in. - From unshielded power lines or electrical equipment in proximity to grounded metal conduit pathway.
    - 6in. - From power lines enclosed in a grounded metal conduit in proximity to a grounded metal conduit pathway
    - 48in. - From motors and transformers.
    - 2in. - From branch circuits of 5kVA or less
- Rooms shall be designed without drop ceilings. Ceiling shall be open to the structure.
- Ceilings and walls should be void of electrical conduits, HVAC duct work, and all plumbing pipe with the exception of that which directly services the room.
- If room is to have sprinkler heads a Dry System, Pre-action, or a Clean Agent Solution should be considered. At a minimum wire cages should be installed around the sprinkler heads to prevent accidental water release.
- HVAC shall be designed to maintain:
    - Control 24hrs a day, 365 days a year.

  - A positive pressure with a minimum of one air change per hour.
  - A temperature between 65 and 80 degrees Fahrenheit, and a relative humidity range of 30 to 55%.
- Floors within the rooms should be treated or tiled to minimize static electricity and dust. Rooms shall be designed without access flooring.
  - Each room should have a minimum 500 lux (50 foot candles) measured at the point of cable termination (36" AFF). Fixtures shall not be placed directly over data racks or cabinets.
- Data Racks
  - Floor mounted 7'H x 19" standard 3" channel spaced data racks shall be installed in each of these rooms for termination of horizontal cabling, optical fiber backbone cabling, and copper backbone cabling as well as the installation of owner furnished network data equipment and associated patching. Each rack has 45 useable Rack Units (1 RU = 1.75").
  - 10" Vertical cable managers with hinged covers shall be installed on each end and between each data rack to provide adequate vertical cable management for patch cords and optical fiber jumpers. Vertical cable managers shall be fingered to allow for 48 Category 6 patch cords to be dressed for each Rack Unit (RU).
  - 2-RU Horizontal cable management with hinged covers shall be installed across the top and middle of each rack to allow for routing of patch cords. Horizontal cable managers for each patch panel will not be required. The use of angled patch panels (below) eliminates that need.
- Data Server Cabinets
  - Not anticipated to be required at this time.
- Overhead Cable Raceway
  - Overhead basket type cable tray shall be provided in each room to transition all horizontal and backbone cabling from the ceiling to the wall field, data racks or server cabinets within the MER or TR's. This cable tray shall be a minimum 18"W x 4"D. All tray shall be supported by a combination of support hardware off of walls, racks, and building structure. Center hung cable trays and center hung support hardware shall not be allowed.
- Grounding
  - A Telecommunication Ground Busbar (TGB) shall be provided in each room as part of the Telecommunication Grounding System. Each TGB shall be bonded to the Telecommunications Bonding Backbone (TBB) which in turn shall be connected to the Telecommunications Main Ground Busbar (TMGB) located in the Telecommunications Room closest to the main electrical service entrance. Minimum grounding backbone conductor in the grounding system shall be #3/0.
  - The TMGB shall be ¼" thick by 4" tall by the length needed for all terminations plus 30% future growth (>/=20").
  - The TGB shall be ¼" thick by 2" tall by the length needed for all terminations plus 50% future growth (>/=12").
  - All data racks, server cabinets, cable trays, lightning protection, metal cable jackets, and equipment per manufacturer's recommendation shall be grounded to the TMGB within the MER and each TGB in each TR using approved two hole ground lugs.
- Cable Pathway & Fire stopping
  - STI EZ-path sleeves or an equal solution for cable pathway from the MER and each TR to the main corridor shall be used on all rated walls. UL listed systems shall be chosen

based on the rating of the wall the cable pathway need to penetrate. Appropriate UL Firestop System labeling shall be required for each penetration installed.

- Additional Systems Space Requirements
  - Space shall be allotted in each room for the following other systems as required:
    - Fire Alarm
    - CATV/MATV
    - Security CCTV and Access Control
    - Future Distributed Antenna System (DAS)

Backbone Cabling

Service Entrance Cabling

- A new service entrance of (4) 4" Ducts shall be provided from the campus ductbank system to the building to support the technology infrastructure. All technology services for the building shall enter through this duct bank and man hole/hand hole system.
- UW Lacrosse campus fiber optic cabling – 96 strands of OS2 singlemode in a dielectric cable – will need to be installed from this building via underground ductbank system to adjacent manhole splice point for inclusion into the campus fiber ring.
- A 100 pair PE-39 copper telephone cable shall service the building. The cable shall be routed to Graff Main for termination.
- All incoming copper cable shall terminate on wall-mounted surge protection in the MER/EF, then onto adjacent 110 style termination blocks for future cross-connection to the building riser.
- All incoming optical fiber strands shall terminate on connectors in rack mounted fiber termination panels in the MER/EF.

Intra-Building Copper Backbone Cabling

- A 25 pair Category 3 24AWG copper backbone shall be installed between the MER and each TR.
- Copper backbone cabling shall be installed onto:
  - Wall mounted 110 style termination blocks in the MER, and;
  - Rack mounted patch panels in the TR's. The cables shall terminate "one pair per port" on the patch panels to facilitate the patching of analog phone lines (POTS), fax, power fail phones, etc.

Intra-Building Optical Fiber Backbone Cabling

- A minimum of 24-Strands of OS2 Singlemode in a dielectric construction shall be installed from the MER to each TR.
- The primary optical fiber pathway shall be installed in innerduct for mechanical protection.
- All optical fiber strands shall be terminated using LC type optical fiber connectors.
- No splices shall be allowed in any optical fiber cable between the MER and any TR. The exception is that fusion spliced singlemode "pig-tails" may be used at the MER and TR at the contractor's discretion.
- 4-RU optical fiber termination shelves shall be used in the MER and be located adjacent to network switch equipment.
- 2-RU optical fiber termination shelves shall be used in each TR. All shelves shall be provided with the appropriate LC Singlemode adapter panels.

Horizontal Category 6 Cabling

- Standard Workstation Locations

  - All cabling shall be UTP Category 6 cabling and shall be capable of be used for voice or data.
  - All four pairs shall be terminated on the telecommunications outlet and in the MER/TR upon rack mounted 48-port angled jack panels.
  - At standard outlet locations Faceplates shall be flush wall mounted or flush furniture mounted type faceplates.
  - All horizontal cable shall be terminated at the jack and on patch panels using the TIA-568B wiring standard.
  - Minimum compliant category 6 cabling shall not be considered. Cabling shall exceed category 6 standards.
  - Each Coaxial cabled CATV/MATV workstation outlet shall be cabled with a single RG-6 cable as well as a single category 6 cable.
  - The structured cabling system shall be provided as a certified cabling system. The manufacturer or manufacturers of the cable and termination components shall qualify and warranty the performance of the entire system for a minimum of (20) years.
- Wireless Access Point Workstation Outlets
  - All data cabling shall be FTP Category 6A and shall be capable of being used for wireless data and voice and be PoE IEEE 802.11ac compliant.
  - Each WAP location will receive (2) Cat 6A data drops.
  - All four pairs shall be terminated on the telecommunications outlet and in the MER/TR upon rack mounted 24 and/or 48-port angled patch panels.
  - At the Wireless Access Point outlet locations, surface mounted boxes shall be installed above the drop ceiling.
  - These workstations shall be installed with 15ft. of slack installed at the workstation coiled on the last J-hook before the outlet for the ability to adjust these workstations based on coverage needs.
  - It is the assumption that predictive RF surveys shall be accomplished prior to installation of the cabling. Then cabling shall be installed based on these predictive surveys.
  - A sound preliminary wireless layout for the facility would have each Wireless Access Point located on a grid pattern with a separation of approximately 9m between AP's on each floor throughout the entire facility.
  - A post-deployment RF surveys should be performed once the access points are installed and the system is energized.
  - The contractor should include preliminary surveys; post surveys (and re-deployment time as needed), as well as installing the customer provided Access Point Radios and patch cords at each WAP location.
  - It is assumed Owner furnished network equipment, wireless controllers, etc. shall be installed by the owner or an owner representative.

6.7.11 Access Control Security Systems

System Description

- CBORD is the preferred product manufacturer. Installation shall mirror phase 1 science building.
  - Traditional hardwired exterior door devices.
  - IP locksets at interior doors.
- Contractor shall provide rough-in for security systems as follows:
  - Contractor shall provide all raceways and backboxes for the security equipment along with power to door locking hardware as required.
  - Contactor shall provide a category 6 data cable to each door controller.

6.7.12 Synchronized Clock System

System Description

- All synchronized clocks within this facility shall be time corrected via existing Primex wireless signal. A wireless signal extender shall be located in the Basement of the facility.
- All clocks shall be battery clocks, and either digital or analog as desired by the Owner.
- Quantity and location of clocks throughout the facility shall be discussed further with the Owner.

Equipment and Materials – Wireless System

- Clocks: Class 1 Notice to utilize Primex.

6.7.13 Distributed Antenna System (DAS)

System Description:

- A DAS system for emergency responder radio signal transmission shall be provided in the Basement.
- Provide a $50,000 allowance for the system.

6.7.14 Audio-Visual Systems

System Description:

- Data connections shall be installed based on location and Owner requirements for network connections with conference rooms for Owner provided video conferencing and Polycom type voice only conferencing.
- Conduits and flush mounted outlet boxes shall be designed for specialized Owner or AV contractor cabling between AV and/or network devices.

6.8 Audio-Visual Systems

Similar to the Phase 1 building, this facility is envisioned as a technology-rich research and learning environment offering students and faculty forward-thinking technology capabilities including wired and wireless network access, visual presentation, and collaboration. Moreover, the Phase 2 building is planned to house a variety of audiovisual-intensive spaces including classrooms, labs, conference and meeting rooms and open student collaboration spaces. For ease-of-use and familiarity for both student and faculty, we assume that the exact or similar AV systems will be provided to those implemented within the Phase 1 building. Further discussions will be required to determine those most appropriate for the Phase 2 building. The following represents an initial Draft of the Audiovisual Program expressing our interpretation of what has been gathered from meetings and interviews to date, plus results of prior work by the design team. Where there are no specific directions provided, we will be guided by our experience, focusing on innovative applications which will enrich and strengthen the student experience and assist faculty in improving student outcomes.
As the planning and design process progresses, we will work in conjunction with the appropriate departments to establish a more detailed and finite technology program, acknowledging University guidelines, preferences and standards where applicable to accommodate these guidelines.

Audiovisual System Requirements

The following room-by-room system descriptions are organized by space type categories as referenced from the current architectural program. This section identifies the planned system components based on the functionality for each space type. The audiovisual technologies are categorized as follows:

- Display – The display systems planned across the building include a variety of solutions including dual ceiling-mount projectors with two motorized projection screens, a single, ceiling-mount projector and associated projection screen, a high-definition flat panel display, and student computer monitors (as possible secondary screens).

- Input Sources – The source devices planned for the classrooms and some labs include a dedicated all-in–one touch PC, analog and digital laptop connections, a Blu-ray player, document camera, and auxiliary inputs for portable devices.

- Capture / Collaborate – The ability of the audiovisual systems to provide capture and collaboration to users is defined for spaces either through wired or wireless connections. Capture can be provided through PTZ (pan-tilt-zoom) cameras and the reinforcement microphones planned for in each room's AV system. These components can be easily incorporated with the campus media capture platform for archiving and remote viewing.

  Collaboration technologies promote interaction between students and between students and the instructor via gateway hardware and software that allows BYOD devices to be mirrored, and then shared for collaboration purposes.

  New collaboration technologies are constantly emerging providing the users additional flexibility to work together and share content. However, we understand that the solution utilized in the Phase 1 building was based around a Mersive Solstice Pod. For the purpose of this report we have assumed that the Phase 2 solutions will be exact or similar to the Phase 1 Solstice Pods.

- Sound – The components or type of sound system that provide program audio and/or speech reinforcement to the users. This includes microphones, ADA hearing assist systems for hearing impaired students, and loudspeakers, either distributed in-ceiling or provided at the display or wall.

- We understand that the base audio reinforcement systems utilized in the Phase 1 building consisted of a variety of manufacturers including Revo Labs, Extron, and Lab Gruppen. For the purpose of this report the planned solutions will utilize exact or similar products to those provided in the Phase 1 building.

- Control - The audiovisual systems in each space will require user control to power, select sources, or adjust volume. The audiovisual control system can also interface with room lighting, motorized shades, and projection screens where these systems also include control modules. Control includes user interfaces such as push button panels, wired or wireless touch panels, or an iPad application. These devices will be connected to the building LAN to enable remote Room Management.

  We understand that the collaboration solution utilized in the Phase 1 building was based around a Crestron solution. For the purpose of this report the planned control systems are planned to utilize the exact hardware or similar to those provided in the Phase 1 building.

- Furniture – Technical furniture may include equipped lecterns, equipment racks integrated in provided custom casework, a finished mobile free-standing equipment rack, or a full-height equipment rack in a remote location, such as an equipment room.

Classrooms: Basic AV System Components

All of the classrooms in the building can be defined as a single "room type" with common infrastructure requirements and equipment to support a base level of functionality. While their geometries and configurations may differ, their base level of audiovisual presentation capabilities will be similar. These systems will be flexible and scalable to accommodate future upgrades or modifications should user needs require.

The following audiovisual components are planned:

Planned Audiovisual Components	
Display / Projection	• 16:10 format, tab-tensioned projection screen • 3LCD, 1920x1200 video projector (Owner - Furnished)
Input Sources	• A Computer w/ wireless keyboard & mouse (Owner - Furnished) • An Ergotron LCD monitor mount • Cable Cubby® with Extended Length Cable Retraction System • - Cubby to include: VGA + audio, HDMI, USB and AC Power Outlet • - Cubby is planned to be located at the instructor's table • Auxiliary inputs for portable devices • Blu-ray™ / DVD player (Owner - Furnished) • Document camera (Owner - Furnished) • All-in–one touch PC w/ MediaSite software

Capture/Collaborate	• Mersive - Wireless Presentation Gateway (Owner - Furnished) • Content and audio capture via Mediasite Platform • Infrastructure to support a fixed video camera (future)
Switching & Distribution	• 4K / Ultra HD video and audio signal switcher
Sound	• Two separate audio systems: • - Program Audio; full-range stereo • - Speech Reinforcement; ceiling tile speakers • Dual-channel wireless microphone system: • - lapel microphone for instructor speech reinforcement and capture • - hand held microphone for student reinforcement and capture • Inputs for ADA hearing assist system
Control	• Integrated building technology processor • Tabletop touchpanel • - Interface controller for functions such as AV system power, input switching, volume, lighting, shades, and others as needed.
Furnishings	• Small A/V Equipment Rack to secure processing and sources • Main Instructor Station – mimic existing "campus standard" • Secondary instructor table for demonstrations and auxiliary use • Additional AC Power and Network Outlets

The projection system and other features for each classroom type will vary based on the room's size and AV system requirements. The special requirements and solutions for each environment are defined below.

150-Seat Large Classrooms:
The 150-Seat Large Classrooms will provide a duel projection solution, including two fixed, ceiling-mounted video projectors and two ceiling-recessed projection screens. The instructor will have the capability to show the same image on both screens or display two separate images simultaneously. The screens will be sized and positioned in each room to maximum student sightlines, while limiting obstruction of the whiteboard.

Medium Classrooms (40 & 50-Seat) and Advance & Introductory GIS Labs and Math Education & Science Education Laboratories):
The Medium Classrooms will provide one fixed, ceiling-mounted video projector and one ceiling-recessed projection screen, which will serve as each room's presentation system. The projection screens will be located off to one side at the front of the room, angled, limiting obstruction of the whiteboard.

72-Seat Active Learning Classroom:
The Active Learning Classroom will provide the exact equipment complement as described above, including a single projection solution, which can be utilized for a typical "lecture-style" presentation, when necessary. The projection system will consist of one fixed, ceiling-mounted video projector and one ceiling-recessed projection screen. The projection screen will be located off to one side at the front of the room, and angled, allowing maximum access to the whiteboard area.

Additionally, the room will support small group collaboration for team-based learning activities. A wall-mounted flat panel display will be located at each of the 12 group tables which will serve as their primary

monitor. These can also act as a supplemental display for the students, by the instructor simply routing their video signal to each wall-mounted display.

During small group collaboration exercises, the software-based connection allows the students to create and edit content concurrently on their local display. The instructor can preview and approve the request to display content. The wireless tablet/laptop connection software will be consistent with the campus standard and software licensing at the time of implementation. For the purpose of this report the collaboration solutions are planned to be based upon the Mersive Solstice Pod.

All audiovisual inputs and outputs will route through a matrix switching system giving the instructor maximum flexibility. Via the icon-based touchpanel they will have he capability to route any source to any display. Though the touch-panel icon design is planned to be consistent with campus standards, significant modifications will be necessary to accommodate the range of video and audio routing options.
There was some discussion around the need for dedicated team-to-team content sharing and distribution. As the project progresses, further dialogue with the user groups will be required to determine the level of team content sharing for this space.

Adequate wireless network bandwidth is critical to the successful implementation of the planned technologies. A contemporary student will expect to connect multiple devices to the building's wireless network. This requires an IT design that ensures the building's network remains stable, especially during peak hours of operations and bandwidth usage.

Medical Mycology, Botany & Mycology Labs: Basic AV System Components

These labs are planned to be exactly the same as the labs within the Phase 1 building; providing a common infrastructure and equipment complement to support required functionality. These systems will be flexible and scalable should programs change or user needs require.

While their geometries, layouts and configurations may differ, their base level of audiovisual presentation capabilities will be similar. The following audiovisual components are planned:

Planned Audiovisual Components	
Display / Projection	• 16:10 format, tab-tensioned projection screen • 3LCD, 1920x1200 video projector (Owner - Furnished)
Input Sources	• Computer w/ wireless keyboard & mouse (Owner - Furnished) • Ergotron LCD monitor mount • Cable Cubby® with Extended Length Cable Retraction System • - Cubby to include: VGA + audio, HDMI, USB and AC Power Outlet • - Cubby is planned to be located at the instructor's table • Auxiliary inputs for portable devices • Blu-ray™ / DVD player (Owner - Furnished) • Document camera (Owner - Furnished) • All-in–one touch PC w/ MediaSite software
Capture/Collaborate	• Mersive - Wireless Presentation Gateway (Owner - Furnished) • Content and audio capture via Mediasite Platform

Switching & Distribution	• 4K / Ultra HD video and audio signal switcher
Sound	• Two separate audio systems: • - Program Audio; full-range stereo • - Speech Reinforcement; ceiling tile speakers • Dual-channel wireless microphone system: • - lapel microphone for instructor speech reinforcement and capture • - hand held microphone for student reinforcement and capture • Inputs for ADA hearing assist system
Control	• Integrated building technology processor • Tabletop touchpanel • - Interface controller for functions such as AV system power, input switching, volume, lighting, shades, and others as needed.
Furnishings	• Small A/V Equipment Rack to secure processing and sources • Integrated Instructor Table

Computational Computer and Gen/Chem Analytical Computer Labs: Basic AV System Components
These two Computer Labs are planned to provide software-based applications at each student bench as either a fixed computer workstation with connected computer monitors, or portable devices such as laptops or wireless iPads. The computing devices are planned to be provided by the University for in-room use by the students.

In addition to their special software applications, both labs will provide a base audiovisual system, similar to the classrooms, but with a limited level of presentation functionality. These systems will be flexible and scalable should programs change or user needs require.

The following audiovisual components are planned:

Planned Audiovisual Components	
Display / Projection	• 16:10 format, tab-tensioned projection screen • 3LCD, 1920x1200 video projector (Owner - Furnished)
Input Sources	• Computer w/ wireless keyboard & mouse (Owner - Furnished) • Ergotron LCD monitor mount • Cable Cubby® with Extended Length Cable Retraction System • - Cubby to include: VGA + audio, HDMI, USB and AC Power Outlet • - Cubby is planned to be located at the instructor's table
Capture/Collaborate	• Mersive - Wireless Presentation Gateway (Owner - Furnished) • Content and audio capture via Mediasite Platform
Switching & Distribution	• 4K / Ultra HD video and audio signal switcher
Sound	• Full-range, ceiling tile speakers • Dual-channel wireless microphone system

Control	• Integrated building technology processor • Tabletop touchpanel • - Interface controller for functions such as AV system power, input switching, volume, lighting, shades, and others as needed.
Furnishings	• Small A/V Equipment Rack to secure processing and sources • Integrated Instructor Table

Conference Rooms: Basic AV Components
Typical Conference Rooms, Student Organization Space and Stats Consulting

All of the conference and meeting spaces will include a similar infrastructure design and equipment to support a base level of functionality. These systems will be flexible and scalable to accommodate future upgrades or modifications should user needs require.
There was discussion regarding the need for audio and/or video conferencing capabilities for some of these spaces, including PC-based, "soft-codec" conferencing solutions such as Skype® for Business, WebEx®, and GoToMeeting®.

For the purpose of this report only a base presentation system is planned. Further dialog is required to determine the conferencing requirements for any of these spaces.

The following audiovisual components are planned:

Planned Audiovisual Components	
Display / Projection	• 16:10 format, tab-tensioned projection screen • 3LCD, 1920x1200 video projector (Owner - Furnished) • OR • Large flat panel display
Input Sources	• Cable Cubby® with Extended Length Cable Retraction System • - Cubby to include: VGA + audio, HDMI, USB and AC Power Outlet • - Cubby is planned to be recessed in the table
Capture/Collaborate	• Mersive - Wireless Presentation Gateway (Owner - Furnished) • Video and audio conferencing is *not* planned for at this time • Video and audio recording is *not* planned for at this time
Switching & Distribution	• 4K / Ultra HD video and audio signal switcher
Sound	• Full-range, ceiling tile speakers
Control	• Wall-mounted, push button controller • Easy-to-use Ethernet controller for AV functions such as AV system power, input switching, and volume control - Lighting and shade control is not anticipated at this time
Furnishings	• Small A/V Equipment Rack to secure processing and sources • Credenza – to house the small rack and resource materials

Collaboration Spaces: Basic AV Components

Student Collaboration Learning Areas and Faculty/Student Research

All of the collaboration and collaborative learning spaces will include a similar infrastructure design and equipment complement to support a base level of functionality. These systems will be scalable to accommodate future upgrades or modifications should user needs require.

While their geometries, layouts and configurations may differ, their base level of functionality will be similar. Each area will support small meetings and group collaboration utilizing a flat panel display and a wireless presentation gateway. The wireless collaboration system will be consistent with the campus standard and software licensing at the time of implementation. For the purpose of this report the collaboration solutions are planned to be based upon the Mersive Solstice Pod.

The following audiovisual components are planned:

Planned Audiovisual Components	
Display / Projection	• 55" Professional LED Display
Input Sources	• Auto-sensing wall-mounted input plate • - Inputs to include: VGA + audio and HDMI
Capture/Collaborate	• Mersive - Wireless Presentation Gateway (Owner - Furnished)
Switching & Distribution	• Not required
Sound	• Audio from LED display integrated speakers
Control	• Wall-mounted push button controller • Easy-to-use Ethernet controller for AV functions such as power, input switching, and volume control
Furnishings	• Collaboration table/furniture

Math Research Team Collaboration Room

The Math Research Team Collaboration will support meetings and small group collaboration. Currently the room is planned to provide three separate collaboration systems as described above, including flat panel displays and wireless presentation gateways for each of the three teamwork areas. These systems will be scalable to accommodate future upgrades or modifications should user needs require.

Cyber Café: Basic AV Components

The Cyber Café is planned to be an area for social gatherings and small group activities and collaboration. A collection of flat panel displays for casual TV viewing is planned, each with a separate tuner allowing different channels per display. The exact quantity of these displays will be dependent on the final furnishing configuration and campus desires. A small complement of pendent ceiling may be desired for TV audio reinforcement and/or background music. Further discussion with the campus will be required to define the audiovisual needs for this space.

The following audiovisual components are planned:

Planned Audiovisual Components	
Display / Projection	• 55" Professional LED Displays
Input Sources	• Auxiliary inputs for portable devices such as MP3 Player • AM/FM Tuner
Sound	• Zoned background music system • Full-range, pendent ceiling speakers
Control	• Wall-mounted push button controller • Easy-to-use Ethernet controller for AV functions such as power, input switching, and volume control
Furnishings	• Collaboration table/furniture

Building-wide Audiovisual Systems

Digital Signage and Way-Finding

As part of the larger building-wide systems, a public information Digital Signage system is expected to be implemented in a similar fashion to the Phase 1 building. The digital signage system is planned to consist of a wall-mounted flat panel display and network-based digital signage media player.

We understand that the solution utilized in the Phase 1 building included 55" professional displays and BrightSign media players. For the purpose of this report the planned solutions will utilize the exact or similar products to those provided in the Phase 1 building.

Moreover, we utilize an anticipated quantity of four digital signage displays per floor, roughly the same count as the phased 1 building. Further discussion will be required with the university to define the necessary quantity and locations of these displays.

Metacontrol

As part of the larger building-wide AV management system, the Crestron Fusion monitoring and scheduling software is expected to be implemented in a similar fashion to the Phase 1 building - providing an efficient way for the Technology Staff to manage and support the audiovisual systems.

Order of Magnitude Cost

To help advance the decision-making process and to aid planning and budgeting efforts, a high-level cost analysis has been derived for the Audiovisual Systems to provide the functionality described herein. As the Audiovisual program has been further advanced and with deeper understanding of user needs and requirements, earlier costs from Concept Design have been further refined and are provided as a range of values.

It is anticipated that the Probable Cost for the installed audiovisuals systems will be roughly $1,800,000. The individual equipment costs used for this report are based on the latest MSRP (Manufacturer's Suggested Retail Price) with some considerations made for increases over the duration of the anticipated construction schedule. General administration and hardware freight costs have been included. Additionally, an anticipated AV Contractor discount off the equipment has been applied at 18%. It is expected that UWL will most likely be able to purchase the hardware at a discounted rate under a competitive bidding process. The reductions realized by the university will depend on a variety of factors, including project delivery method, market conditions at the time of bid, quality of the bid package, the need to acquire subsets of the program over time due to available funding, and others.

Ultimately, the cost realized by the University will be largely dependent on the extent and level of technology deployed for the building. Several factors should be explored in order to reach an Opinion of Probable Cost that aligns with the campus' available resources for the project. These include:

- Whether or not all classrooms and labs will be outfitted in the same manner.
- The level of technology and features required for Day 1 occupancy versus those planned for future deployment.

The specific items included and ***not*** included in the Audiovisual Opinion of Probable Cost are as follows:

Does include:	*Does Not* include:
• In-Wall Blocking for AV equipment mounting	• Cable pathways (j-boxes, conduit, tray/ladder)
• Specialty Wall and Floor Boxes	• Standard whiteboards/marker boards
• Projection Screens	• General use computers
• All Audiovisual Systems Equipment and Cabling	• Custom millwork
• Labor and Control System Programming	• Data Electronics and Severs
• Anticipated Owner-Furnished Equipment	• Distributed antenna systems

The Anticipated Owner-Furnished Equipment is expected to include:

- All video projectors and lens
- All flat panel and Digital Signage displays
- Wireless collaboration gateways
- All dedicated instructor workstations
- All managed switches

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7.1 Overview

The following code review is based on the current Wisconsin Enrolled Commercial Building Code, which references the 2009 International Building. It is organized by relevant chapters based on the 2009 International Building code. *The construction phase of the project will need to adhere to the applicable codes in effect at the time of accomplishment which may be different than the current regulations.*

7.2 Chapter 1: Administration

Public buildings and places of employment constructed or altered in the State of Wisconsin are to meet the requirements of the Wisconsin Enrolled Commercial Building Code. In addition to these rules the State of Wisconsin, Division of Facilities Development design standards are to be followed. The Department of Safety and Professional Services of Wisconsin will perform a review of the building design prior to construction to ensure compliance with the Wisconsin Enrolled Commercial Building Code.

7.3 Chapter 2: Definitions

Area of Refuge – An area where persons unable to use stairways can remain temporarily to await instructions or assistance during emergency evacuation.

Atrium - An opening connecting two or more stories other than enclosed stairways, elevator, hoistways, escalators, plumbing, electrical, air conditioning or other equipment, which is closed at the top and not defined as a mall.

Common Path of Egress Travel – That portion of exit access which the occupants are required to traverse before two separate and distinct paths of egress travel to two exits are available. Paths that merge are common paths of travel. Common paths of egress travel shall be included within the permitted travel distance.

Control Area - Spaces within a building where quantities of hazardous materials not exceeding the maximum allowable quantities per control area are stored, dispensed, used, or handled.

Corridor – An enclosed exit access component that defines and provides a path of egress travel to an exit.

Exit Access – That portion of a means of egress system that leads from any occupied portion of a building or structure to an exit.

Exit Enclosure – An exit component that is separated from other interior spaces of a building or structure by fire-resistance-rated construction and opening protective, and provides for a protected path of egress travel in a vertical or horizontal direction to the exit discharge or the public way.

Fire Barrier – A fire-resistance rated wall assembly of materials designed to restrict the spread of fire in which continuity is maintained.

Fire Separation Distance – Means of distance measured at right angles from the face of the building wall to one of the following:

1. The closest interior lot line
2. To a permanent no-build easement line
3. To the centerline of a street, alley, or public way
4. To an imaginary line between 2 buildings on the same property

Fire Wall – A fire-resistance-rated wall having protected openings, which restricts the spread of fire and extends continuously from the foundation to or through the roof, with sufficient structural stability under fire conditions to allow collapse of construction on either side without collapse of a the wall.

Means of Egress – A continuous and unobstructed path of vertical and horizontal egress travel from any occupied portion of a building or structure to a public way. A means of egress consists of three separate and distinct parts: the exit access, the exit, and the exit discharge.

Occupant Load – The number of persons for which the means of egress of a building or portion thereof is designed.

Penthouse – An enclosed, unoccupied structure above the roof of a building, other than a tank, tower, spire, dome cupola or bulkhead.

Primary Structural Frame – The primary structural frame shall include all of the following structural members:

1. The columns;
2. Structural members having direct connections to the columns, including girders, beams, trusses, and spandrels;
3. Members of the floor construction and roof construction having direct connections to the columns; and
4. Bracing members that are essential to the vertical stability of the primary structural frame under gravity loading shall be considered part of the primary structural frame whether or not the bracing member carries gravity loads.

7.4 Chapter 3: Use and Occupancy

The intended use of the building determines the Occupancy Classification. All parts of the building are considered independently from one another by their intended usage. This building falls into two occupancy classifications: A, which includes spaces utilized for assembly, and B, which includes educational facilities above the 12th grade. These disparate occupancies exist in the building without separation and as such must be considered as a whole, held to the strictest occupancy type requirements in various code sections. As such the overall building classification is non-separated mixed use. If the occupancy types are to be separated then 2 hour fire-barriers would be required.

7.5 Chapter 4: Special Detailed Requirements

In addition to the occupancy and construction requirements of other code sections, the provisions within this chapter apply to specific situations.

The openings between the lower level and first floor at the west café and south arrival space are considered atriums by definition. As an atrium of only two adjoining floors it is not required to be enclosed nor does it require a smoke control system.

7.6 Chapter 5: General Building Heights and Areas

The allowable building height and area are based on a combination of Occupancy Classification and Construction Type. Disparate occupancies exist in the building without separation and as such must be considered as a whole, with the requirements of the strictest occupancy governing the height and area restrictions for the entire building. Given this limitation the building as a Type IIA Construction (Chapter 6) may be 4 stories and 54,250 square feet per floor (Table 503) when the appropriate modifications for having a sprinkler system throughout the building and open frontage around the perimeter are applied. With Construction Type IB the building would have increased allowances resulting in unlimited area and a maximum height of 12 stories.

7.7 Chapter 6: Types of Construction

The building may be categorized as IIA construction or IB construction. These construction classifications are considered as non-combustible. There are strict limitations on combustible elements and materials and where they can be utilized. As a Type IIA construction the primary structural frame, exterior and interior bearing walls, floor and roof construction and their secondary members are to have a fire-resistance-rating of one hour. As Type IB construction these elements are 2 hour fire-resistance-rated. Where the building has a separation distance of greater than 30 feet exterior elements are not further required to have fire-resistance ratings, this applies to the building, with the exception of changes due to the application of Phase 2 if Type IIA construction is utilized.

7.8 Chapter 7: Fire Protection Features

The fire-resistance rating of structural elements is based on the requirements of Chapter 6. The allowable area of openings in exterior walls is based on Fire Separation Distance. The Fire Separation Distance of greater than 20 feet for a building with a sprinkler system means that the amount of openings in exterior walls is unlimited.

Due to the construction classification, the size of the addition, and the occupancy types contained within, a fire wall will not be required.

Shafts protecting openings and penetrations between floors are to be fire-resistance-rated fire barriers. This applies to elevator shafts, required means of egress stairs, duct chases, etc. These enclosures are to be 1 hour fire-resistance-rated when connecting three or fewer floors and 2 hour fire-resistance-rated when connecting four or more floors. Openings in these enclosures are also to be fire-resistance-rated. Where the fire barrier is to be 1-hour rated the doors are to be 1-hour rated as well. For 2-hour fire barriers the doors are to be 1 ½ hour rated. Fire barriers are to be continuous from, and securely attached to, the floor

assembly below to the underside of the floor above. Supporting structure shall also be fire-rated equal to the barrier supported.

Corridors are to be rated as required by the Occupancy Type. With the installation of the required sprinkler system throughout the building, corridors for this project are reduced to a 0-hour fire-resistance rating.

7.9 Chapter 9: Fire Protection Systems

The building is required to have a sprinkler system installed throughout. This is based on the Occupancy Type. A Class I standpipe system is to be located within the building. Connections for the standpipes shall be located in required stairways. These standpipes are to be interconnected. Portable fire extinguishers are required to be located in areas where flammable or combustible liquids are stored, used, or dispensed and within special hazard areas as required by the fire code official.

7.10 Chapter 10: Means of Egress

Means of egress requirements are based upon the Occupant Load for any given space. The Occupant Load is determined by a factor assigned the intended use of a space applied to the square footage of that space. This Occupant Load may be reduced (limited) from that calculated by the typical means with permission from the code official and permanent signage at the space indicating the maximum restricted load. Loads may be increased (set) as long as the increase number is used for Occupant Load dependent calculations. The majority of the spaces for this project are based on the programmatic needs of the Owner. The Occupant Loads for this building are as follows:

Level 0		
Room No.	Room Name	Program Occ Load
1C.1	80 Seat Classroom	82
1C.2	80 Seat Classroom	82
1F.1	Classroom Support	7
2C	Collaborative Learning	126
2J1	Shop (Dirty)	21
2J2	Shop (Clean)	6
2J3	Maker Lab	28
2N	Student Organization	22
2P4.1	Specimen Museum (ND)	6
2P4.2	Specimen Museum (ND)	8
2P2	Specimen Museum (TC)	40
2P6	Specimen Museum (Office)	1
3Y	Animal Care Facility	24
8H/8I	Physics Lab Support	5
12	Mechanical/Electrical	28
Level 0 Total		486

Level 1		
Room No.	Room Name	Program Occ Load
1D	72 Seat Classroom	74
1E.1	150 Seat Classroom	152
1E.2	150 Seat Classroom	152
1F.2	Classroom Support	7
2C	Collaborative Learning	34
2M	Café	86
2G	Print	1
2P1	Specimen Museum	16
2P5	Herbarium	18
3P	Botany/Mycology Lab/Prep	33
3P1	Biosafety Cabinet	7
3P2	Medical Mycology	18
3AA	Greenhouse/Prep	47
5D3	Lab Manager	1
5J	Introductory GIS Lab	34
5K1	Advanced GIS Lab	34
5N	Faculty/Student Research	16
5P	Support	5
6L2	Statistics Consulting	18
8R	Computational Comp. Lab	24
11	Dean's Office Suite	29
11H	Dean's Conference Room	46
12P	Mail	1
Level 1 Total		853

Level 2		
Room No.	Room Name	Program Occ Load
1A.1	40 Seat Classroom	42
1A.2	40 Seat Classroom	42
1F.3	Classroom Support	6
2A3	Science Ed Research	6
2A4	Science Ed Resource	6
2C	Collaborative Learning	21
2D.1	Testing	1
2F.1	Conference Room	32
2F.2	Conference Room	32
2G.2	Printing	1
2K	Faculty Resource	30
2L.1	Vending & Seating	8
4T	Gen Chem Computer Lab	32
8T	Faculty/Student Research	16
12	Electrical/IT	2
	Offices/Reception	83
	Work Rooms/Storage/Files	6
Level 2 Total		366

Level 3		
Room No.	Room Name	Program Occ Load
1B.1	50 Seat Classroom	52
1B.2	50 Seat Classroom	52
1F.4	Classroom Support	6
2C	Collaborative Learning	21
2D.2	Testing	1
2F.3	Conference Room	32
2G.3	Printing	1
2K	Faculty Resource	30
2L3	Vending & Seating	8
4U	Shared Chem Comp Lab	18
4W	Faculty/Student Research	5
6L1	Math Research	16
6M	Undergraduate Research	20
12	Electrical/IT	2
	Offices/Reception	84
	Work Rooms/Storage/Files	6
Level 3 Total		354

Level 4		
Room No.	Room Name	Program Occ Load
2A1	Science Ed Methods Lab	34
2A2	Science Ed Support	18
2K	Faculty Resource	30
2D.3	Testing	1
2G.4	Printing	1
2C	Collaborative Learning	21
2F.4	Conference Room	32
2L.3	Vending & Seating	8
6K.1	Math Education Lab	34
6K	Math Education Support	6
6K.2	Math Education Lab	34
12	Electrical/IT	2
	Offices/Reception	102
	Work Rooms/Storage/Files	6
Level 4 Total		329
Penthouse/Roof		
Room No.	Room Name	Program Occ Load
	Mechanical/Electrical	31
	Waiting	20
	Observation	50
	Telescopes	12
Penthouse Total		113

With these Occupant Loads each floor requires 2 means of egress. The building as a whole requires 4 means of egress. The width of egress components are also based on these Occupant Loads. Egress stairs need to be a sized to accommodate 0.3 inches of width per occupant that it serves. Doors and other egress components are to be sized as 0.2 inches of width per occupant served. Given these factors the two required stairs are to be 54.9" each from the second floor to the exit. The stair from the lower level is to be a minimum 72.9". Although not required by the Wisconsin Enrolled Commercial Building Code, the State of Wisconsin, Divisions of Facilities Development and Management requires areas of refuge at egress stairs. One area of refuge is required at each stair.

Rooms and spaces with an Occupant Load of 50 or more require doors to swing in the direction of egress. A space with an Occupant Load of 50 to 499 people requires 2 means of egress. The building as a whole requires a minimum of 4 means of egress. The egress doors to exit from the building are to be a minimum of 500 inches total. The doors to the stairs at the second floor are to be 36.6" each, from the third floor they are to be 35.4" each, from the basement they are to be 48.6" each, and fourth floors doors are to have 32.9" clear width doors at each stair. Doors serving stairs from the rooftop observatory and penthouse are to be code minimum 32" clear. Stair from the rooftop observatory and penthouse are to be code minimum 44" clear.

The common path of egress travel to an exit enclosure shall not exceed 75 feet. The exit access travel distance shall not exceed 250 feet from any point in the building. Dead end corridors, where serving an occupant load of 50 people or more, shall not be more than 20 feet. If the Business and Assembly Occupancies are separated, areas that only contain Business occupancy may have dead end corridors of 50 feet in length.

Once an occupant has entered into a means of egress component they are to remain within a fire-resistant-rated path until discharged from the building. One of the egress stairs may exit through the first floor if the path to the exterior exit door is readily visible and unobstructed from the point of termination of the stair enclosure. Additionally the first floor will be required to have a 2 hour fire-resistance rated floor assembly.

7.11 Chapter 11: Accessibility

An accessible route connects all levels and spaces within the building. At least 3 of the building entrances are required to be accessible. Toilet rooms meet accessibility requirements for toilet fixtures and partitions and sinks. All elements are to be designed within reach ranges as required.

7.12 Chapter 15: Roof Assemblies and Rooftop Structures

A penthouse is considered a portion of the story below it but does not contribute to the total area or number of stories. The roof of the penthouse shall not exceed 18 feet above the main roof, unless an elevator runs to the roof at which point the penthouse roof may be 28 feet. The aggregate area of any single roof plane which is utilized for a penthouse cannot exceed 1/3 of the area.

7.13 Chapter 29: Plumbing Systems

Plumbing fixture calculations are based on anticipated use of each portion of the Occupant Load. The plumbing fixture count calculation results in the following:

For Assembly Usage (A-3) – Arrival/Gathering (725 Occupants)

Water Closets –	Male	1 per 125	= 3
	Female	1 per 65	= 6
Lavatories		1 per 200	= 4
Drinking Fountains		1 per 500	= 2
Service Sink		1	= 1

For Education Usage (B) – Classrooms/Labs, etc. (1,776 Occupants)

Water Closets –	Male	1 per 50	= 18
	Female	1 per 50	= 18
Lavatories		1 per 50	= 18
Drinking Fountains		1 per100	= 9
Service Sink		1	= 1

Phase 2 Total

Water Closets –	Male	= 21
	Female	= 22
Lavatories		= 22
Drinking Fountains		= 11
Service Sink		= 2

Fixtures located within unisex toilet bathing rooms are permitted to be included in determining the minimum required number of fixtures for this building.

Each toilet room with compartments shall have at least one wheelchair accessible compartment. Where the total number of fixtures in a restroom is six or more then at least one shall be ambulatory-accessible in addition to the wheelchair-accessible compartment. If more than the required number of male fixtures are included in the project, twice the number of surplus fixtures shall be included for the women. Up to 50% of the required male fixtures may be urinals.

8.1 Project Cost Estimate

A primary focus of this concept design phase was to establish a budget for the project. In an effort to provide the most accurate construction cost estimate in this early stage, the Design Team based the cost estimate on the concept drawings along with the detailed narrative descriptions outlined in this report. This approach provides a more accurate depiction of this project rather than using generic square foot costs for this type of facility.

A detailed cost estimate was also prepared by the technology consultant in order to validate the budget for audio-visual equipment. The Design Team's estimate for this portion of work was based on information provided by the campus and indicates the cost for this equipment to be approximately $1,850,000.

8.1.1 Project Cost Estimate Process & Approach

The construction cost estimate has been prepared based on the current concept floor plans, preliminary site design, elevations, renderings, and design narratives as described in this Concept Report. Additional information was relayed to the cost consultant from the Design Team via meetings, phone conversations, and email to clarify the project scope.

This cost estimate is based on the measurement and pricing of quantities wherever information is provided and/or reasonable assumptions for other work not covered in the concept development to date. Unit rates have been obtained from historical records and/or discussions with local contractors. The unit rates reflect current bid costs in the area. All unit rates relevant to subcontractor work include the subcontractors overhead and profit unless otherwise stated.

Pricing reflects probable construction costs obtainable in the La Crosse area on the bid date. This estimate is a determination of fair market value for the construction of this project. It is not a prediction of low bid. Pricing assumes competitive bidding for every portion of the construction work for all subcontractors with a minimum of three bidders for all items of subcontracted work and a minimum of three general contractors. Experience indicates that a fewer number of bidders may result in higher bids, conversely an increased number of bidders may result in more competitive bids.

Since the A/E team has no control over the cost of labor, material, equipment, or over the contractor's method of determining prices, or over the competitive bidding or market conditions at the time of bid, this statement of probable construction cost is based on industry practice, professional experience and qualifications, and represents the A/E team's best judgment as professionals familiar with the construction industry. However, the A/E team cannot and does not guarantee that the proposals, bids, or the construction cost will not vary from opinions of probable cost prepared by them.

The construction cost estimate is based on the following parameters:

- Construction start date of June 2021.
- Construction period of 24 months.
- Contract will be competitively bid to multiple contractors.
- Contractors will have full access to the site during normal working hours.
- Estimate includes pricing as of December 2017.

Item/Description	2021 Start	2023 Start
Construction	$52,767,600	$56,860,000
Other Construction		
Temperature Controls	$1,259,625	$1,259,625
Asbestos Abatement (to be determined)		
Contingency (7.5%)	$3,957,570	$4,264,500
Design & Supervision		
A/E Fees (8%)	$4,221,400	$4,548,800
DFDM Management Fees (4%)	$2,110,700	$2,274,400
Other Fees (1%)	$527,700	$568,600
Equipment		
Movable Equipment & Furnishings (3%)	$1,583,000	$1,705,800
Specialty Equipment – Audio-Visual	$1,850,000	$1,850,000
Total Project Cost	$68,277,595	$73,331,725

Cost Reduction Options:
The design team has considered many options in an effort to lower the project cost. The following options have been discussed with UW-La Crosse as potential cost-saving measures based on a 2021 construction start:

Option A: Animal Care Facility (Construction Only) -$3,500,000

There are many contributing factors that have increased the size of the proposed animal care facility as compared to the existing facility located in the Health Science Center. AAALAC accreditation and NIH guidelines for design of an animal care facility have resulted in additional square footage. Consider removal of entire facility and provide shell space for future.

Option B: Maker Lab (Construction Only) -$175,000

The lower level and current building program identify a space for a Maker Lab area where faculty can collaborate on various projects types. Definition of this space has not yet been determined and the space could remain unfinished until all needs and uses have been identified.

Option C: Accelerated Project Schedule (Project Cost) -$2,220,000

UW-La Crosse sees a tremendous benefit to the campus and to the State of Wisconsin to continue developing the project design through 35% Preliminary Review and move the project into the 2019-21 Biennium. The savings in construction escalation costs would significantly lower the total project cost.

9.1 Project Schedule

The development of this 10% Concept Report was originally planned to begin immediately following bidding of Phase 1 in May 2015. Instead, program verification began in September 2017 and during this process, UW-L noted the importance of having a project cost understood by December 2017 in order to complete their 6-year capital planning and budget requests for UW-System. The project cost was delivered to campus and is being followed by this 10% Concept Report.

UW-La Crosse sees the importance of keeping the Science Labs Building design and construction process moving forward and delivering this two-phase project in a timely manner. As costs continue to escalate, the project budget will continue to climb, creating potential for reduction in building program.

Laboratory spaces included in Phase 1 will be online for the start of the Fall 2018 Semester as scheduled. This leaves much of existing Cowley Hall unused and underutilized. Existing classrooms and offices will maintain their use in this 50+ year-old facility with a number of faculty offices already moved to Cartwright Center. When construction of Phase 2 begins, the remaining classrooms, laboratories, and offices will be required to relocate to other facilities for the construction duration. This extends the maintenance and upkeep of these aging buildings (Cowley Hall and Cartwright Center) longer than desired. Specialty spaces such as the greenhouse, rooftop observatory, mycology lab, etc, will be unable to relocate to temporary facilities for the 24-month construction period.

While there is no certainty as to which biennium this project will be included in, three schedule scenarios have been discussed throughout this concept design process and are outlined as follows:

2021-23 Biennium		
The earliest biennium budget this project could be included in is 2021-23.	10% Concept Design	January 2018
	Preliminary Review	June 2020
	BOR/SBC Approval	June 2020
	Final Review	December 2020
	Bidding	March 2021
	Start Construction	June 2021
	Substantial Completion	June 2023
	Occupancy	September 2023

2023-25 Biennium

10% Concept Design	January 2018
Preliminary Review	June 2022
BOR/SBC Approval	June 2022
Final Review	December 2022
Bidding	March 2023
Start Construction	June 2023
Substantial Completion	June 2025
Occupancy	September 2025

2019-21 Biennium

Because this project has been designed through 10%, UW-La Crosse has made a substantial effort to keep this project moving and is willing to keep the momentum going by funding design efforts through 35%. By doing so, the project budget could save anywhere between $2 and $4 million dollars depending on which biennium the project is enumerated in.

10% Concept Design	January 2018
Preliminary Review	June 2019
BOR/SBC Approval	June 2019
Final Review	December 2019
Bidding	March 2020
Start Construction	June 2020
Substantial Completion	June 2022
Occupancy	September 2022