KDHE

NEW LABORATORY

CONCEPTUAL DESIGN + PROGRAMMING

7 JANUARY 2020

THE CLARK ENERSEN PARTNERS | STATE OF KANSAS

The Clark Enersen Partners

VOLUME I

The **Kansas Department of Health + Environment's (KDHE)** new laboratory facility will address the need for growth in spacial and equipment requirements, and ensure the goals of safety, quality of results, and efficiency are met while paying special attention to principles of sustainable design.

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ACKNOWLEDGMENTS

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SUMMARY OF PROCESS

July 18

01/

Kick-off Meeting

Plot the path and establish the vision for the conceptual design study and programming effort

August 12-13

02/

Departmental Meetings

Assess the space needs, adjacencies, departmental goals, and measures of success for the future Department of Health and Environment Laboratory

September 4-5

03/

Space Type Meetings

Investigate the scope of wants and needs including laboratory equipment for each lab group, and develop laboratory plan diagrams

October 10

04/

Strategy Meetings

Develop alternative scenarios, planning principles, and space strategies for the three site options

October 22

05/

Concept Development/ Refine Space Program

Analyze and refine space strategies and program brief in relation to building concepts, budget, and phasing

1.0

EXECUTIVE SUMMARY

BACKGROUND AND PURPOSE

BACKGROUND

The Office of Laboratory Services at the Department of Health and Environment has supported the health and welfare of Kansas citizens for over 110 years.

DESCRIPTION

The Office of Laboratory Services or Kansas Health and Environmental Laboratories is currently housed in the former hospital on Forbes Field south of Topeka which was built around 1956.

Divided throughout former patient and operating rooms, the current facility does not provide the Kansas Health and Environmental Laboratories with the ability to streamline operations and improve efficiencies. Furthermore, the age of the facility continues to increase operational and repair costs to the state. This report is the outcome of programming services and assessment conducted to determine the need, best location and estimate of probable construction costs for a new facility.

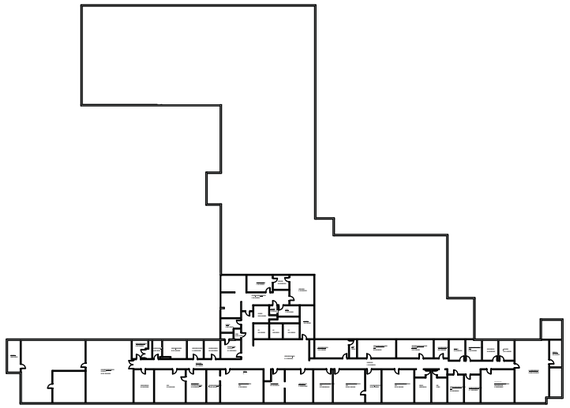
RELEVANCE

The Kansas Health and Environmental Laboratories serve the state of Kansas by conducting chemical and biological analysis of clinical specimines and environmental samples, as well as certifications and laboratory improvement surveys for regulated health, environmental, and law enforcement laboratories.

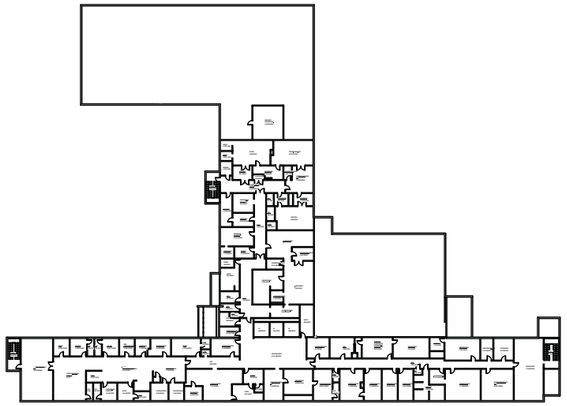
The nature of the services provided by the Office of Laboratory Services affect almost every household in Kansas by conducting tests ranging from drinking water quality to newborn screening to identifying and responding to various infectious outbreaks to ensuring that private laboratory testing is conducted to national standards.

CURRENT FACILITIES

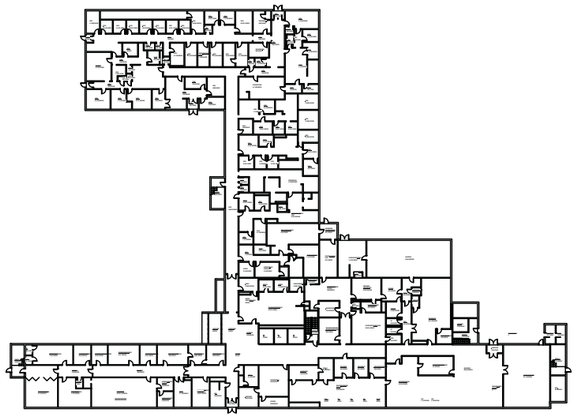
The current KDHE facility is a re-purposed hospital from the 1950s. It's not properly insulated, especially regarding windows and the exterior skin. The building itself is spatially inefficient; there are many pockets of unusable space throughout. The maintenance costs of the current KDHE facility are extensive, and the net to gross efficiency is below standard.



3rd Floor Plan - Existing



2nd Floor Plan - Existing



1st Floor Plan - Existing

PROPOSED SITE LOCATIONS

There were three sites proposed by the State of Kansas for re-purposing into the new KDHE Laboratory. Each site was evaluated based on a number of factors including nearby amenities, ease of access, development costs, recruitment value and proximity to other agencies.

The three sites considered are:

Downtown - This site reutilizes an existing parking lot and transforms it into a public presence for the lab within footsteps of the Capitol Building.

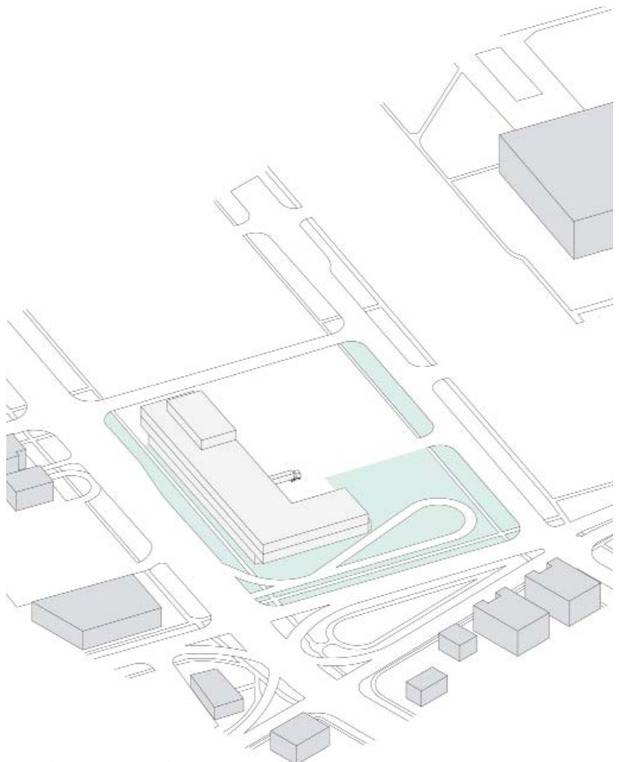
KNI - This State owned greenfield site would provide easy access to Washburn University students who may intern at the facility.

Forbes Field - The site would be directly south of the current lab facility and tied into the existing mechanical plant.

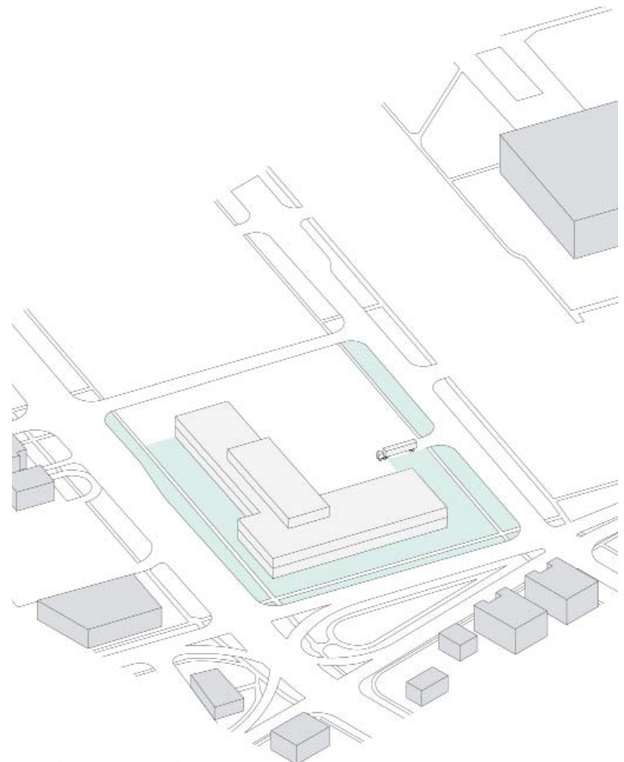
The preference of the lab is to relocate to downtown. This opportunity works best for staff commuters, sample deliveries, proximity to other agency partners, and access to staff amenities. It was also believed that this location would provide the best opportunity for staff recruitment and retention.

MASSING STUDIES

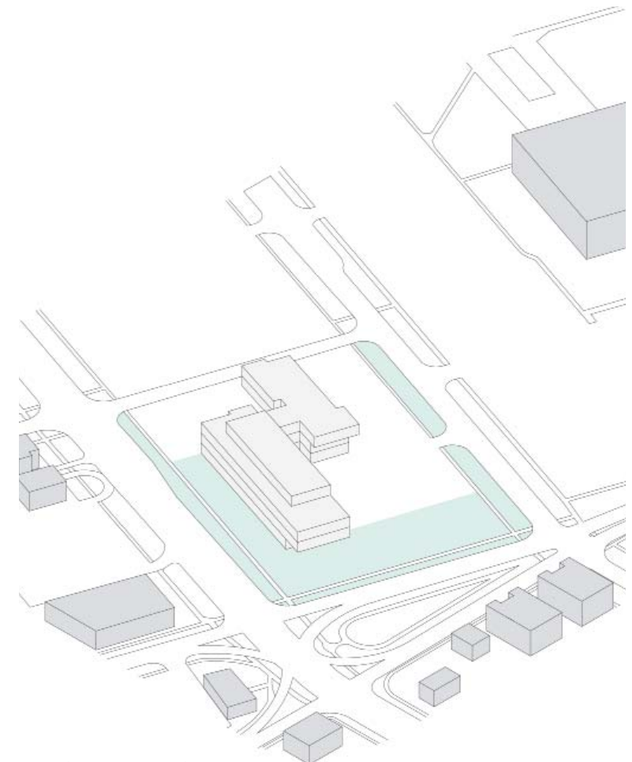
DOWNTOWN SITE



L-Shape Study



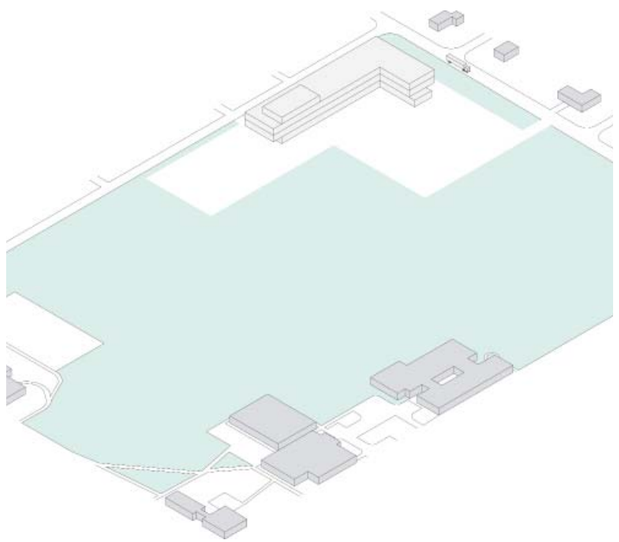
T-Shape Study



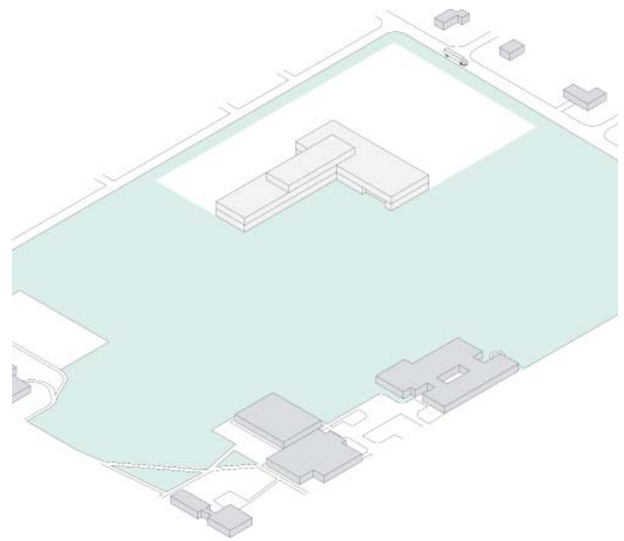
Z-Shape Study

MASSING STUDIES

KNI SITE



L-Shape Study



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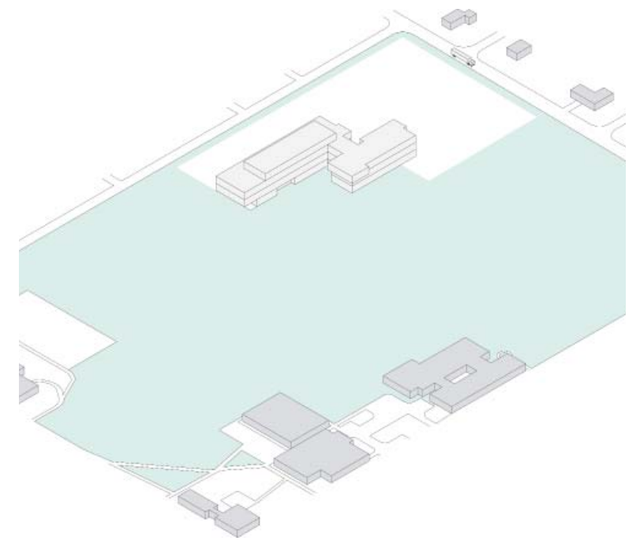
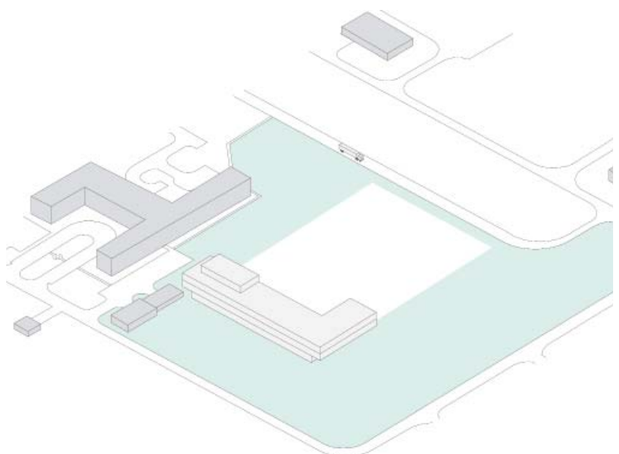


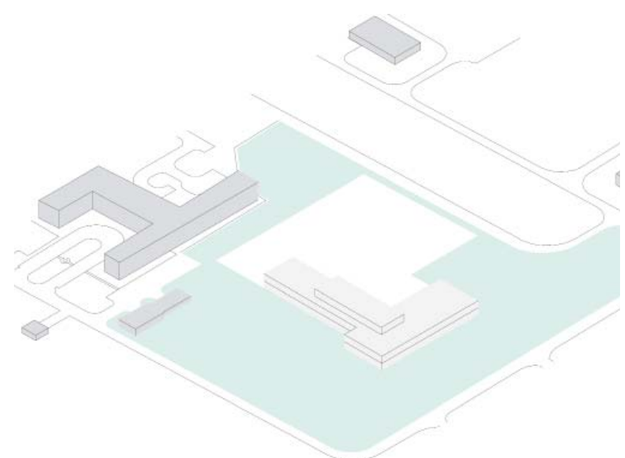
Z-Shape Study

MASSING STUDIES

FORBES SITE



L-Shape Study



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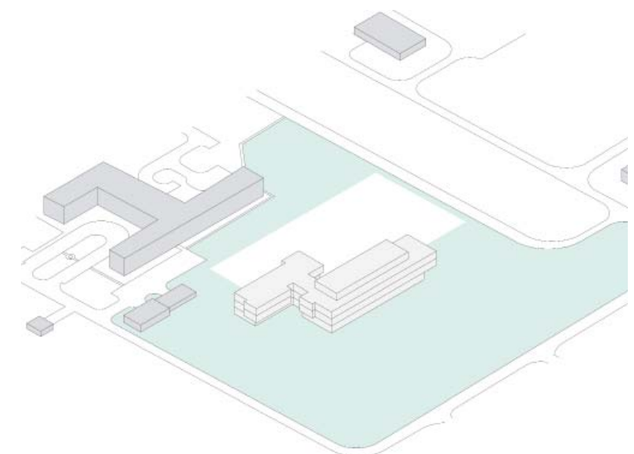


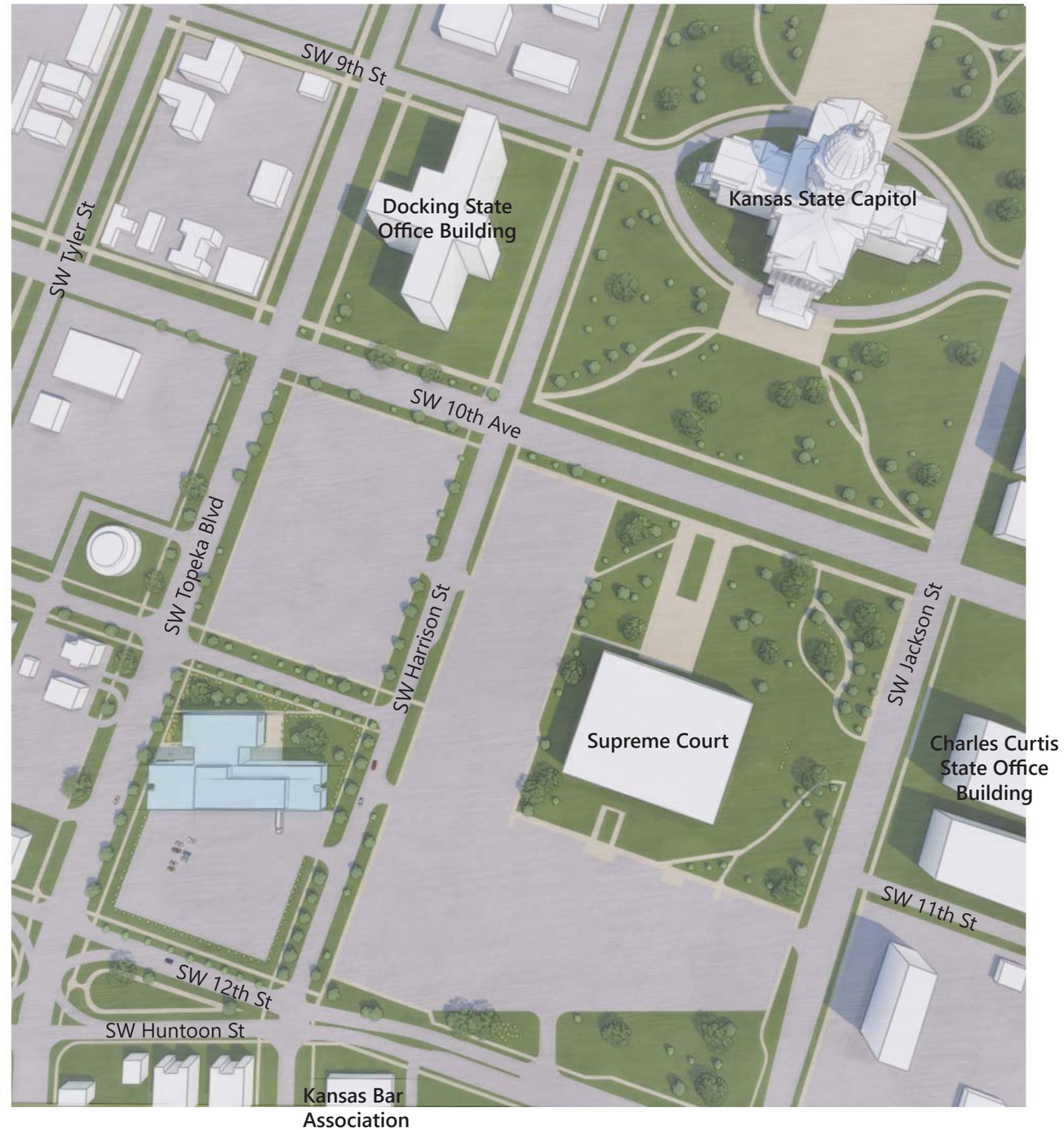
Z-Shape Study

DOWNTOWN SITE CONTEXT

Many opportunities exist surrounding the development of the downtown site. The site plan represented on this page is indicative of that, and highlights future expansion capabilities adjacent to Lot Number 4 beyond the scope of this study. The development shown accommodates growth needs identified during the study and also takes into account enhancements of sustainable design strategies, pedestrian connections, department collaboration, service access and overall access to the building and amenities by both KDHE staff and visitors.

The building mass evolved into the final "I" study. This places offices in the small bar to the north and laboratories in the larger bar to the south. Tying the two bars together is an open zone for collaboration and vertical circulation through the building with bridges between the labs and offices.

Public access is to the north and employee access from the parking lot is to the south. A dedicated service area for shipping and receiving is also included.



DOWNTOWN SITE PLAN

① Public Parking

② EV Parking

③ EPA Trailer Parking

④ Dock

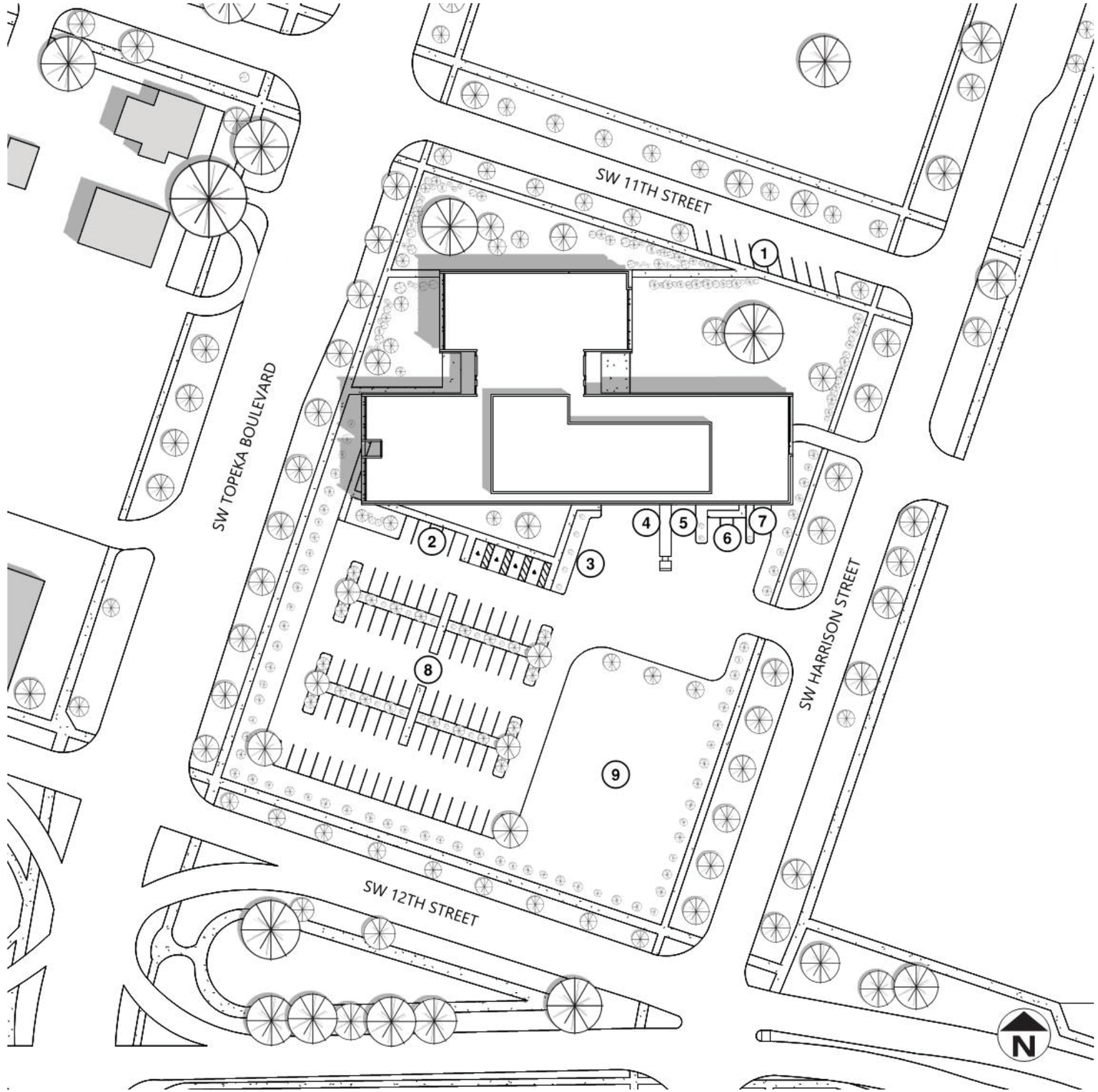
⑤ Back-up Generator

⑥ Sample Drop-off Parking

⑦ Sample Drop-off Drive-up

⑧ Employee Parking

⑨ Bioswales



KNI SITE PLAN

① Public Parking

② EV Parking

③ EPA Trailer Parking

④ Dock

⑤ Back-up Generator

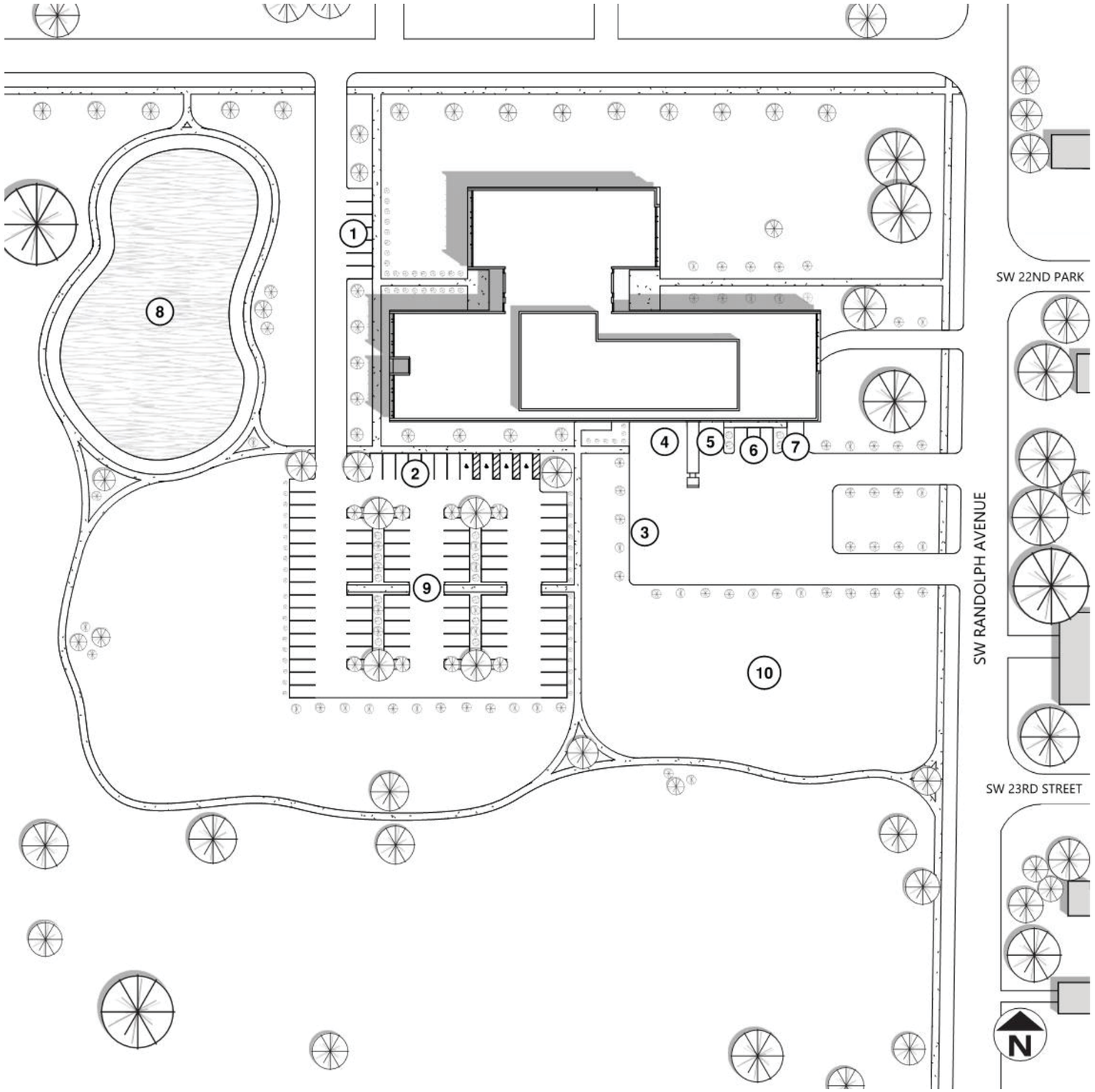
⑥ Sample Drop-off Parking

⑦ Sample Drop-off Drive-up

⑧ Pond

⑨ Employee Parking

⑩ Bioswales



FORBES SITE PLAN

① Public Parking

② EV Parking

③ EPA Trailer Parking

④ Dock

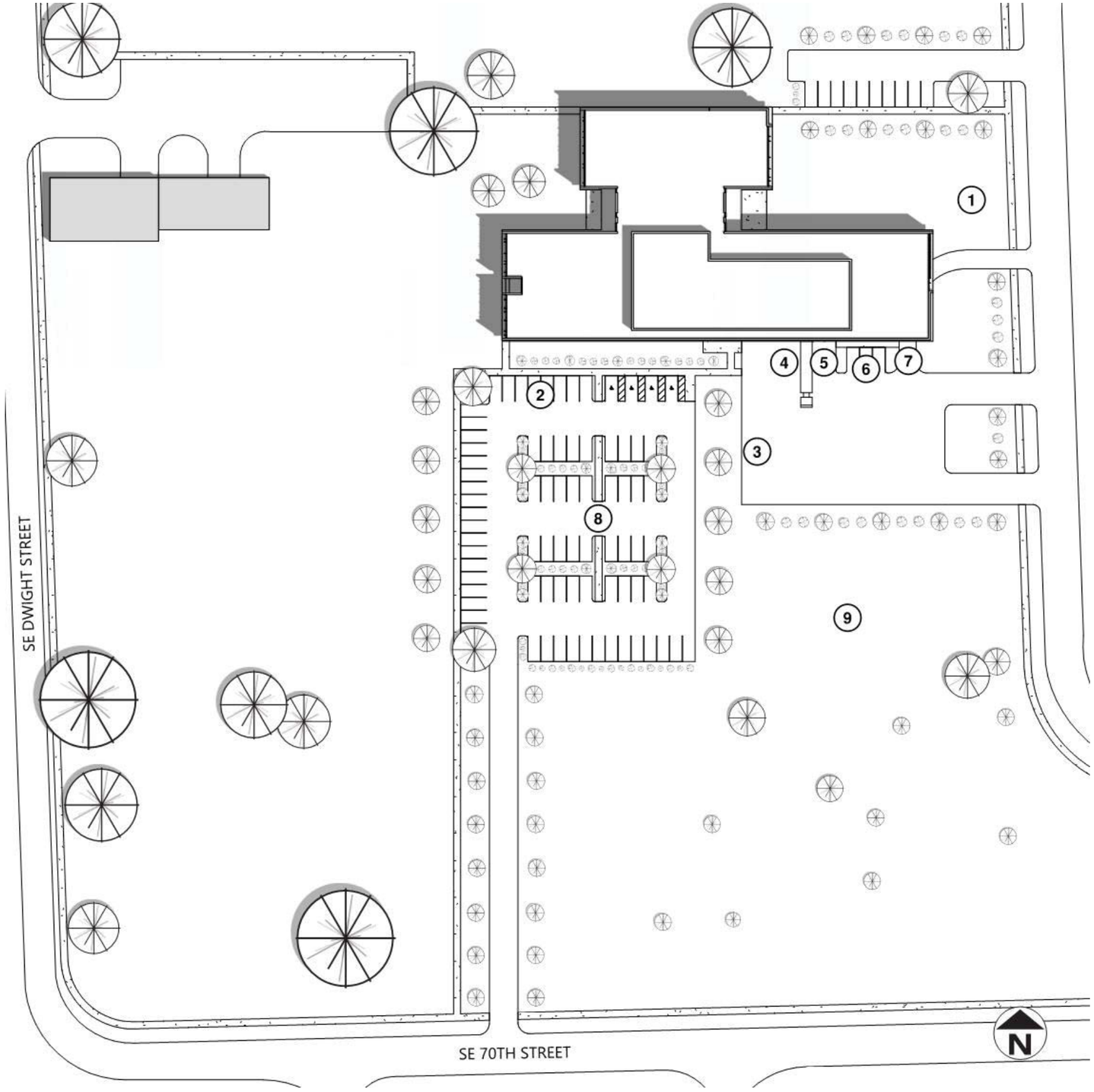
⑤ Back-up Generator

⑥ Sample Drop-off Parking

⑦ Sample Drop-off Drive-up

⑧ Employee Parking

⑨ Bioswales



CURRENT VS FUTURE SPACE NEEDS

DEPARTMENTAL NSF

In order to establish a baseline for current and future space needs for KDHE, multiple meetings were held with each department to determine what currently exists, what currently works, and what needs to improve. A first step in the process was comparing existing space utilization to current best practices.

The team spent the majority of three days observing activities within each of the lab groups. There was learning of how sample, personnel and waste flows were conducted throughout the day - time was spent looking for ways to optimize the basic function for each lab. Offices and non-lab spaces were right-sized based on current practice. The lab staff growth is projected to increase by approximately 20 over time, however with the efficiencies gained in the functional analysis of the lab, the overall NSF for the facility was reduced by 3,455 NSF and net to gross efficiency improved by over 7% for an overall new building of just over 100,000 GSF which is 20,414 GSF smaller.

Most of the efficiencies gained were due to the inefficient current layout of the lab which used to be a hospital. The lab sizes were based on existing hospital patient and ancillary spaces which are not based on a current modular approach to lab design.

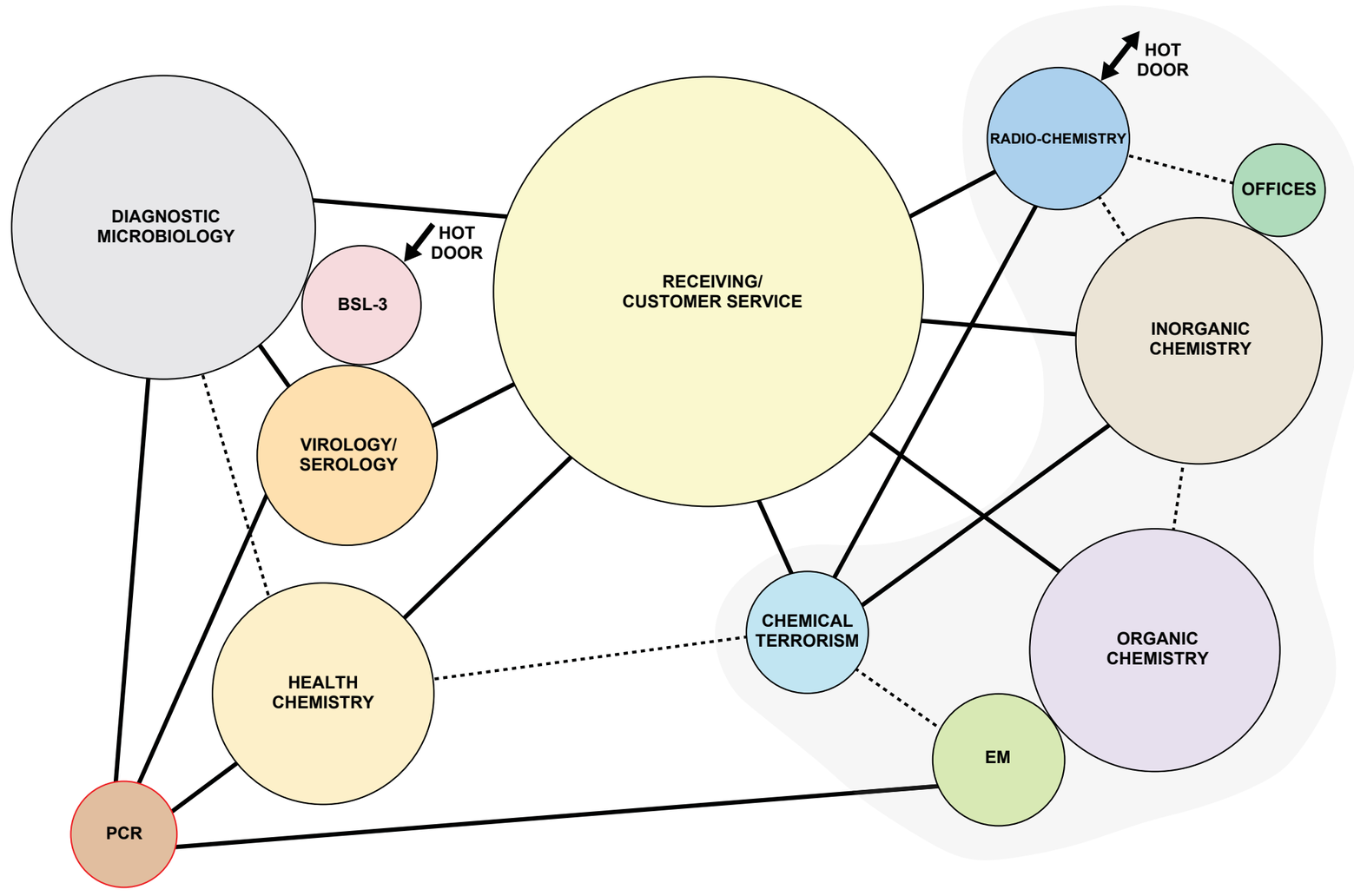
Department	Current NSF	Future NSF
Receiving + Accessioning	12,531	8,730
Health Chemistry	3,808	3,267
Virology + Serology	3,985	2,178
Diagnostic Microbiology	5,703	4,464
Molecular Diagnostics	0	2,664
BSL-3	817	1,464
Organic Chemistry	6,041	5,445
Inorganic Chemistry	8,474	8,650
Offices + Building Support	17,745	20,510
Building Support	5,369	3,645
Total	**64,473**	**61,018**

Current - 2019	Future	Difference
28,828 Lab NSF	28,133 Lab NSF	(695)
35,645 Non-Lab NSF	32,885 Non-Lab NSF	(2,760)
120,443 GSF	100,029 GSF	(20,414)
53.53% Net-to-Gross	61% Net-to-Gross	7.47%
60 Staff	80 Staff	20

ADJACENCY BUBBLE DIAGRAM

The adjacency diagram was developed with the lab managers for each department. The goal was to improve efficiencies of sample and staff flow. The "hub" of operations is Customer Service. Each lab has a main connection to this important accessioning and shipping function.

It was clear that the Health and Environment groups could remain separate with some crossover between EM, PCR, Chemical Terrorism and Health Chemistry. The layout developed utilizing this diagram as a foundational element with some minor revisions based on final input from the lab managers.

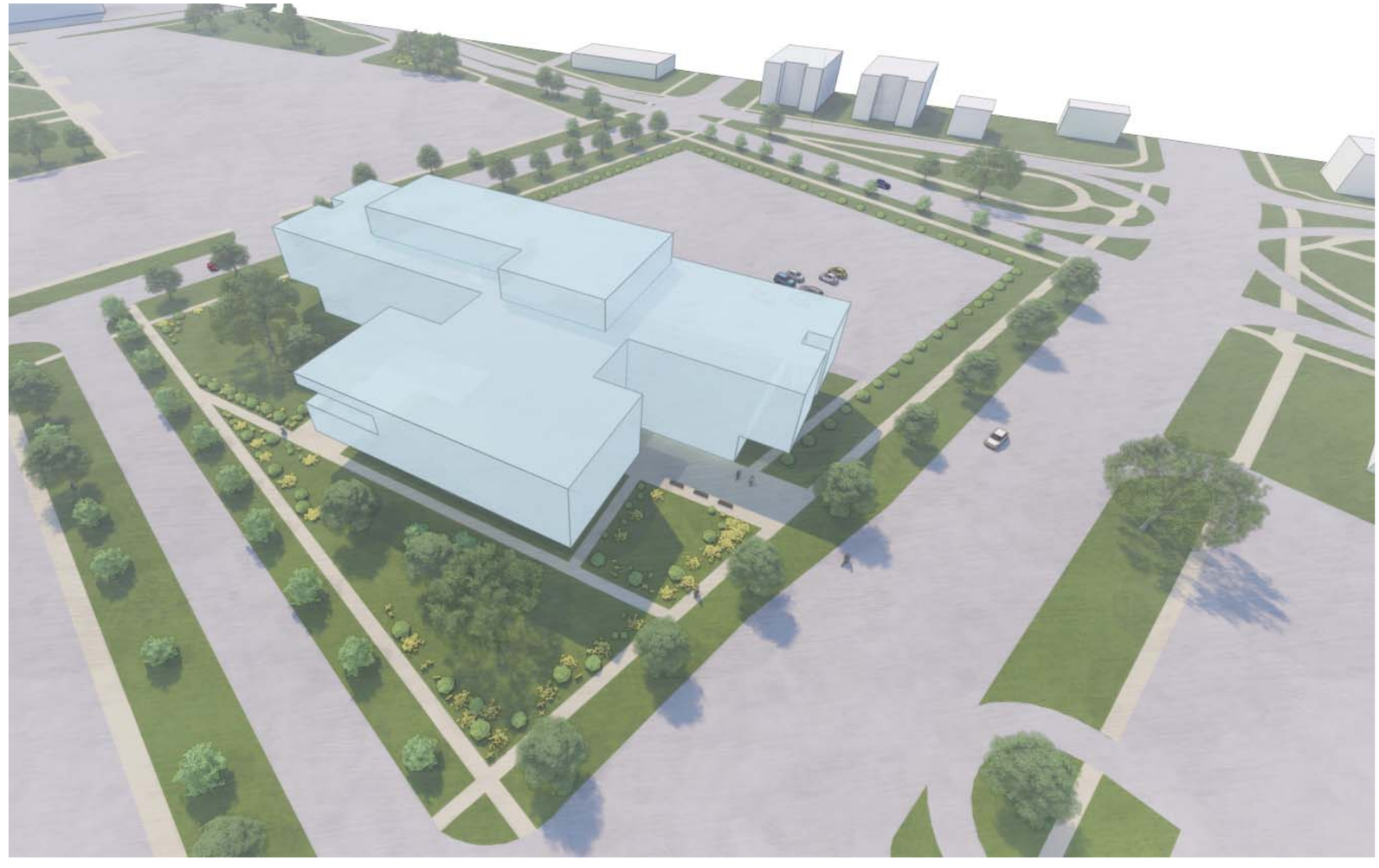


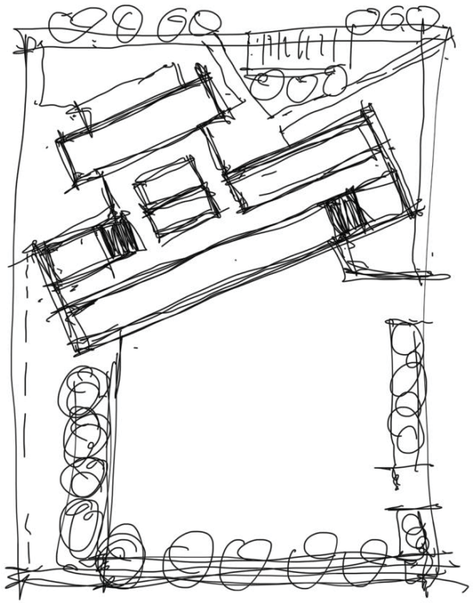
CONCEPT DESIGN

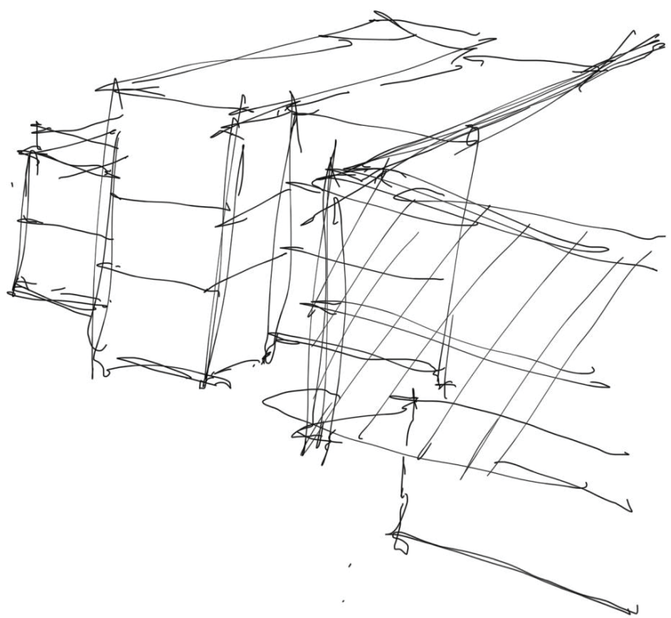
Multiple massing options for the new KDHE Laboratory were considered in order to meet the programmatic needs of flexible, efficient and modular laboratory design. The final massing study is shown and represents an "I" shaped double bar scheme with core vertical circulation and shared collaboration spaces making up the central connection element.

This simple form gave rise to many opportunities including modular planning for the lab space and north and south facing solar orientation, which can be controlled through proper fenestration. Dedicated lab floors act as security control, public spaces are on the first floor for access control and we are able to easily separate the mechanical and structural systems for the lab and non-lab spaces.

These massing studies also helped to identify service locations, daylighting opportunities, sustainable possibilities, site and landscaping, and connections to existing pathways.



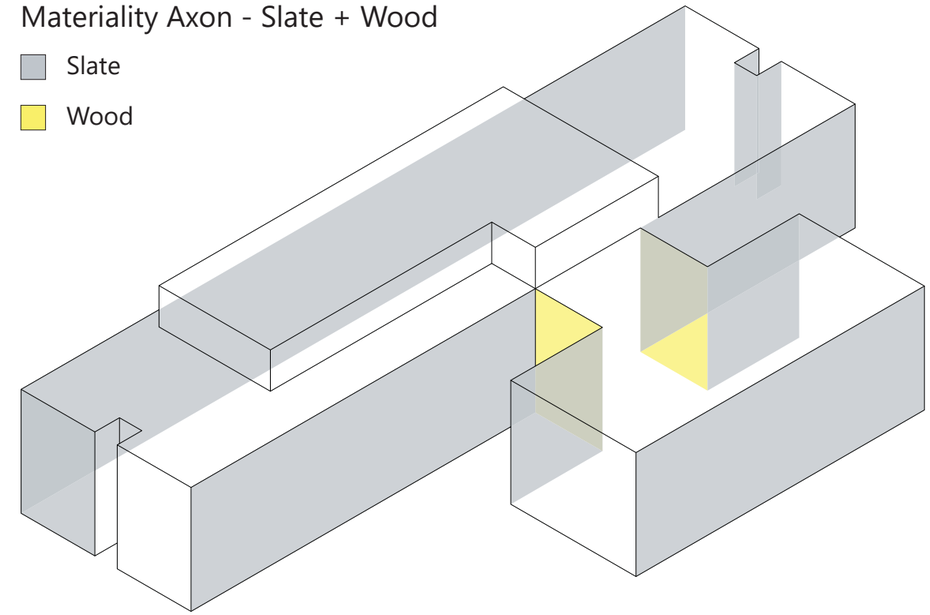




Materiality Axon - Slate + Wood

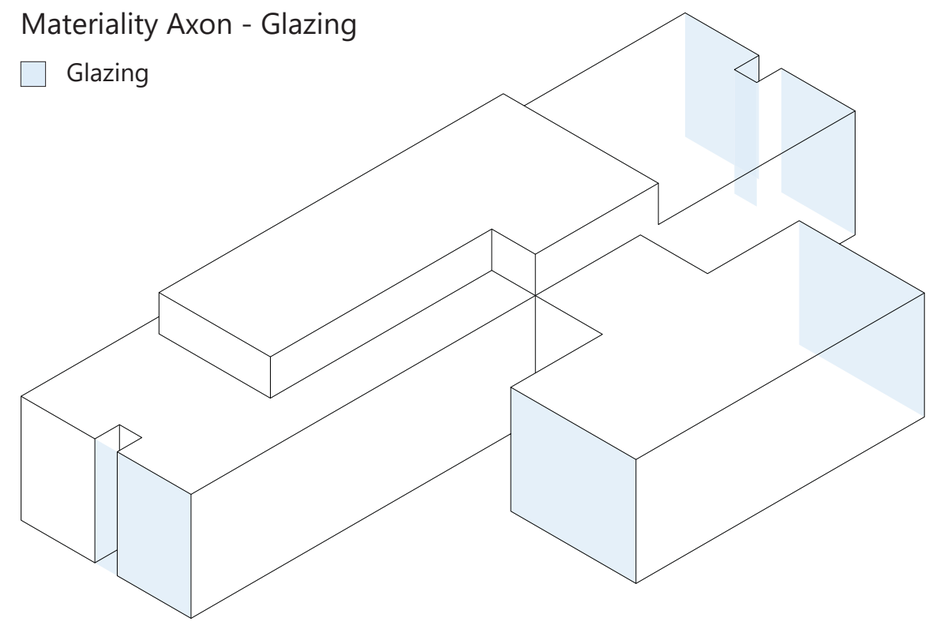
Slate

Wood

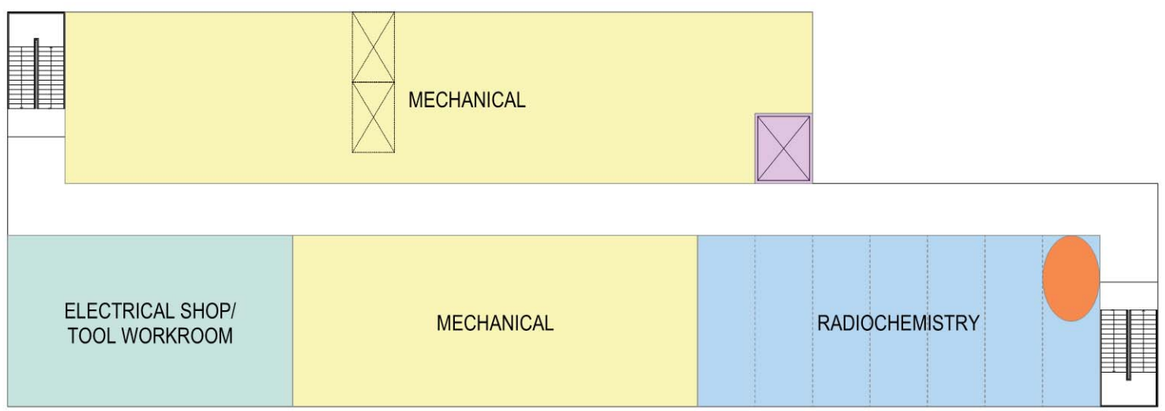


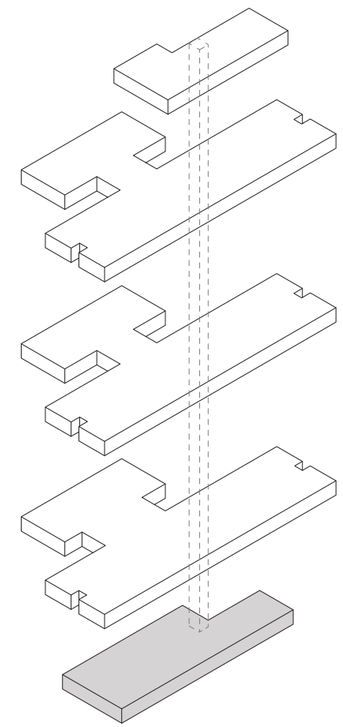
Materiality Axon - Glazing

Glazing



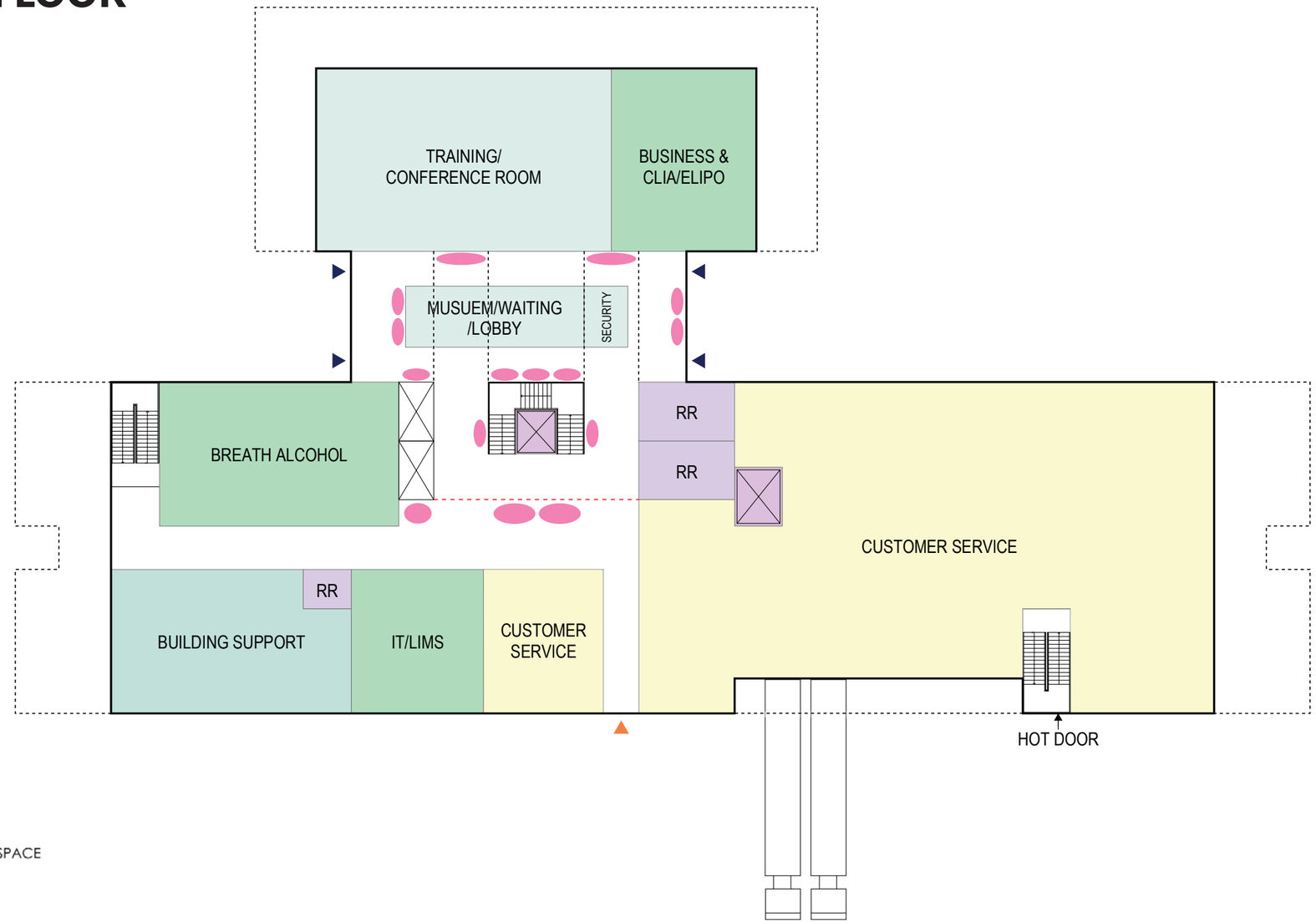
BASEMENT

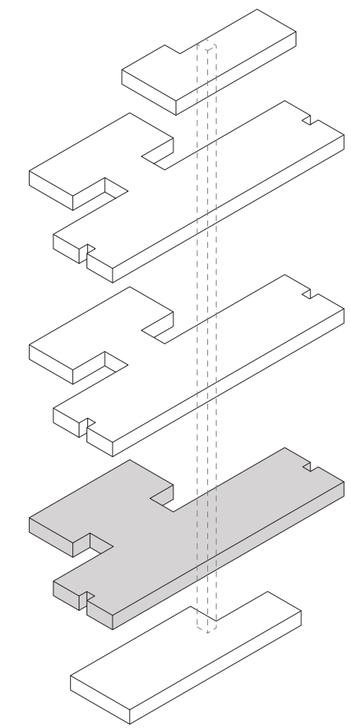




ELEVATOR
COLLABORATION SPACE
STAFF AREA
LINE OF SECURITY
PUBLIC ACCESS
EMPLOYEE ACCESS
DOCK

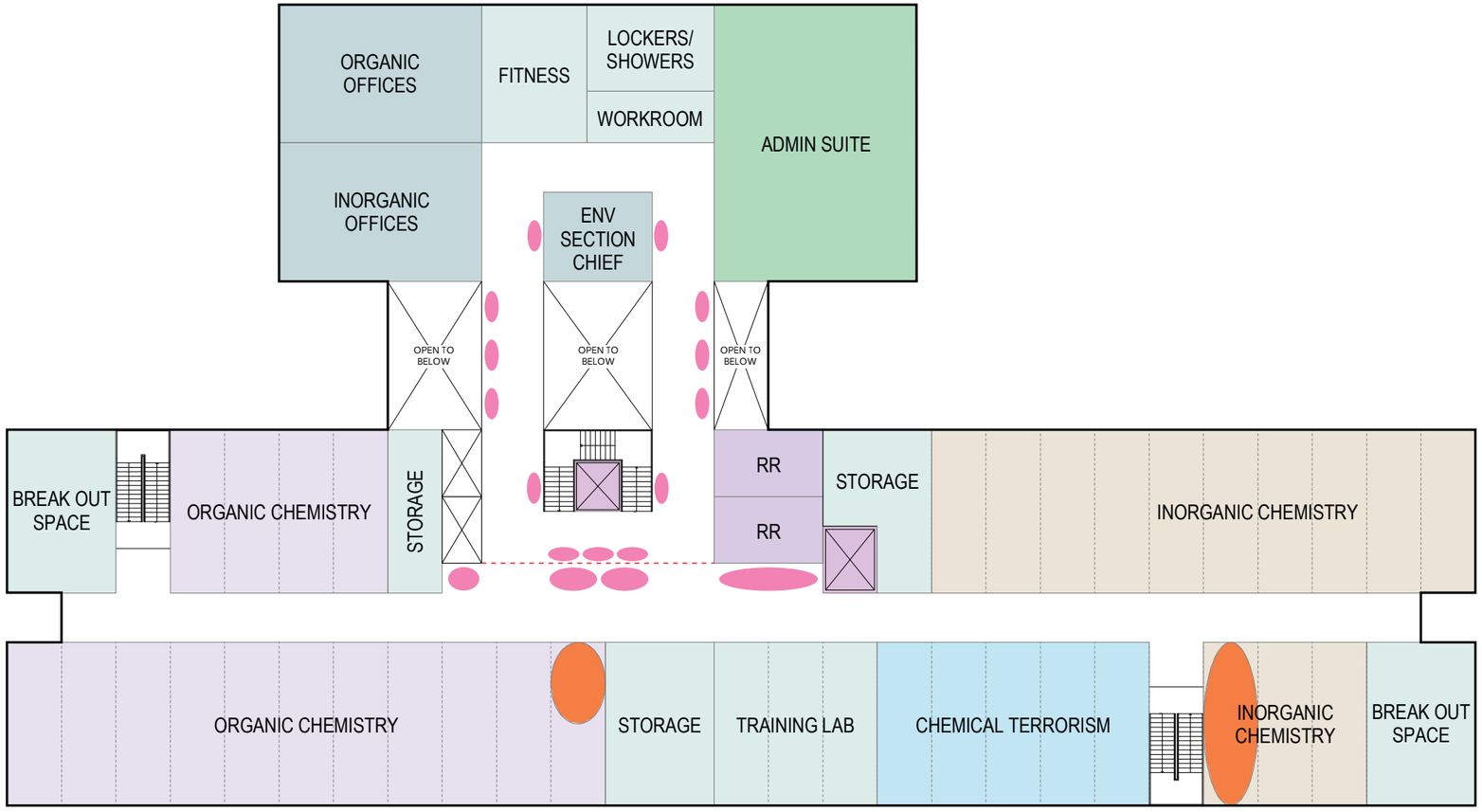
GROUND FLOOR

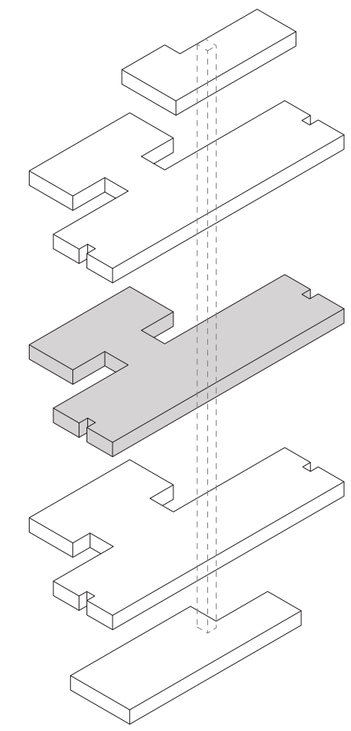




ELEVATOR
COLLABORATION SPACE
STAFF AREA
LINE OF SECURITY
PUBLIC ACCESS
EMPLOYEE ACCESS
DOCK

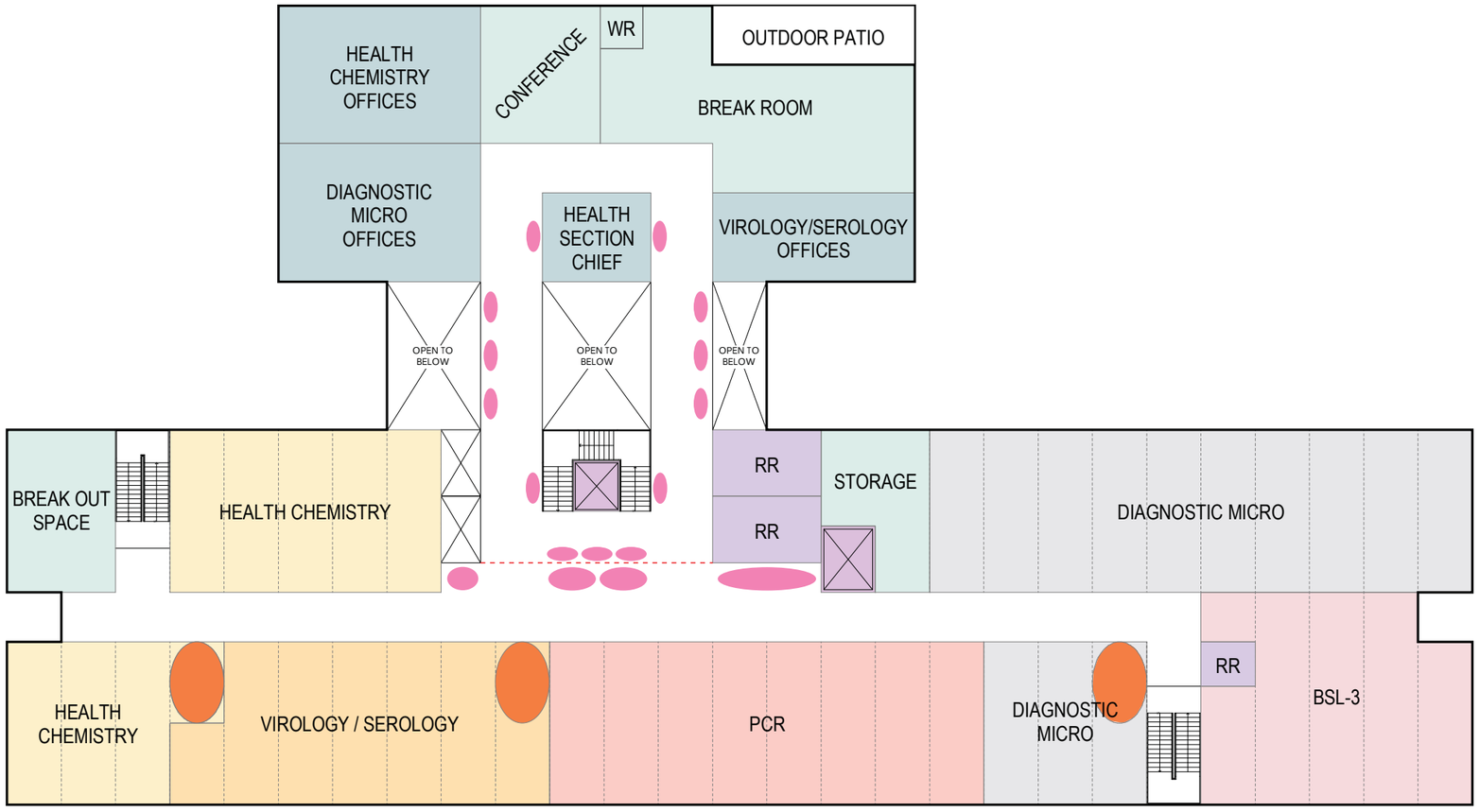
FLOOR 2

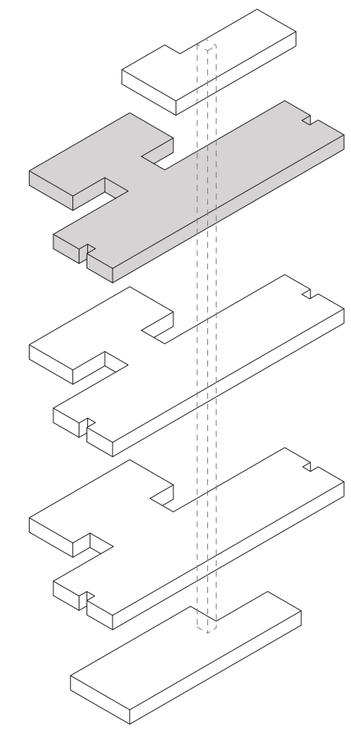




ELEVATOR
COLLABORATION SPACE
STAFF AREA
LINE OF SECURITY
PUBLIC ACCESS
EMPLOYEE ACCESS
DOCK

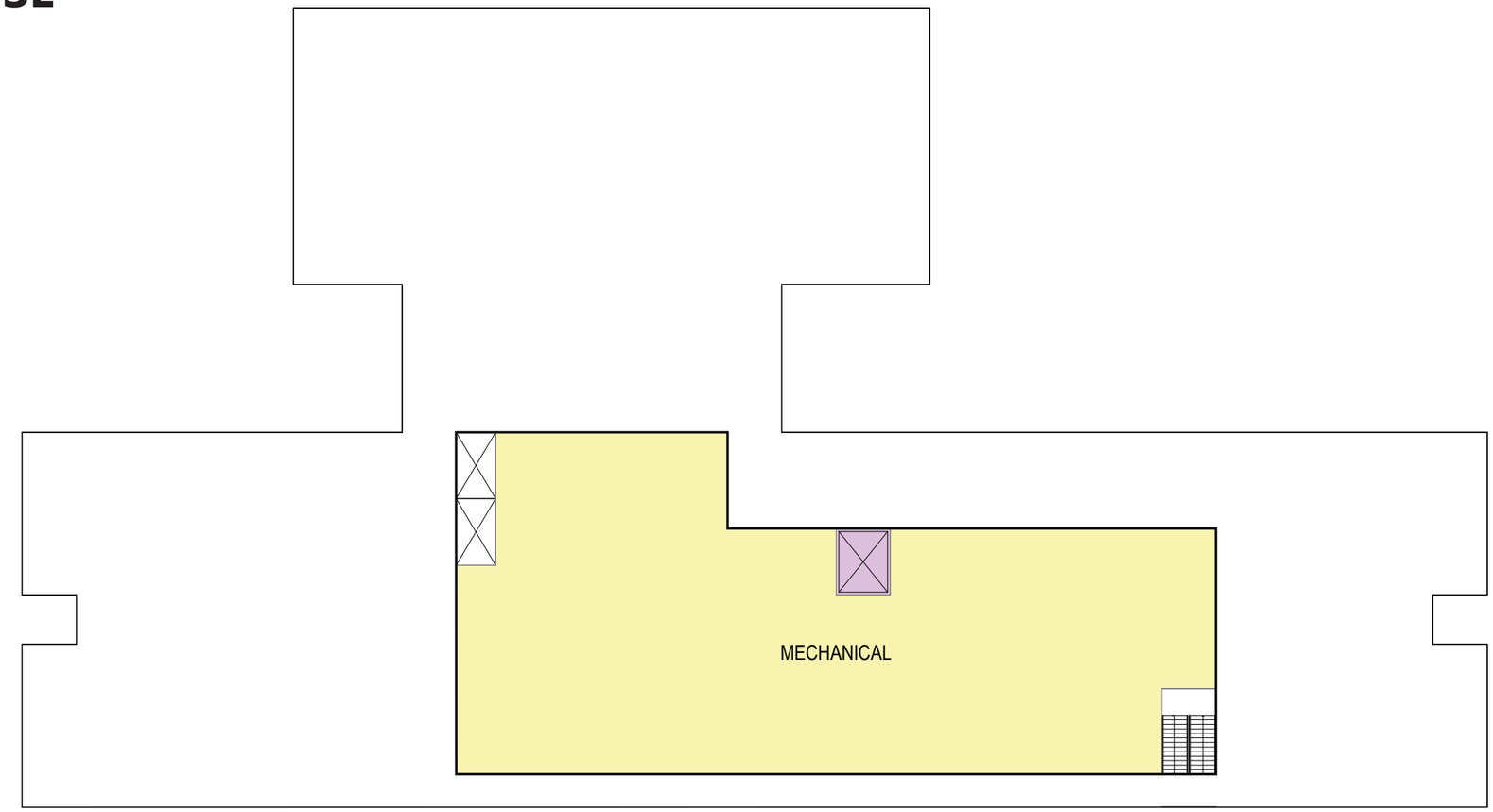
FLOOR 3

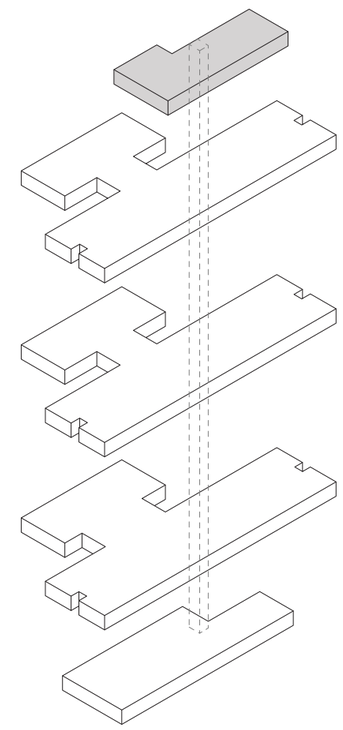




ELEVATOR
COLLABORATION SPACE
STAFF AREA
LINE OF SECURITY
PUBLIC ACCESS
EMPLOYEE ACCESS
DOCK

PENTHOUSE





ELEVATOR
COLLABORATION SPACE
STAFF AREA
LINE OF SECURITY
PUBLIC ACCESS
EMPLOYEE ACCESS
DOCK

CONCEPT IMAGERY

Views and spaces created throughout the course of concept design have been developed via digital rendering in order to visualize opportunities available in and around the project. A mix of entry sequences as well as interior and exterior amenities allow this project to fully engage the downtown area. Not only should this project provide much needed laboratory capabilities to the area, it should add to and improve upon the physical appearance of downtown Topeka.

COST MODEL

The cost model below is based on a test fit of the three sites with around 100,000 GSF of laboratory, office, shared space, building support and other miscellaneous spaces.

Site	NSF	GSF	$ / GSF	Construction Cost	Total Project Cost
DOWNTOWN SITE	61,018	100,029	$418	$41,686,485	**$56,276,755**
KNI SITE	61,018	100,029	$429	$42,786,485	**$57,761,755**
FORBES SITE	60,918	98,255	$425	$41,592,510	**$56,149,888**

ENERGY MODEL

This report, found in Appendix E, evaluated the current proposed design of the new KDHE facility using a total building energy modeling software package. Total building annual energy use and annual energy cost was evaluated and compared to the ASHRAE 90.1-2010 baseline according to Energy and Atmosphere – Prerequisite 2 (Minimum Energy Performance) and Credit 1 (Optimize Energy Performance) of the LEED Reference Guide for Green Building Design and Construction – Version 4.

The building's area includes laboratories, classrooms, offices, and support spaces totaling approximately 110,000 square feet. The schematic design drawings and discussions with the project team served as the basis of this modeling effort. Energy conservation measures (ECMs) have been tested in the energy model and optimized building performance solutions have been suggested based on this testing.

Based on the optimization analysis, a Proposed Case model has been developed that includes the following high performing, yet reasonably attainable, design characteristics:

- Exterior wall construction assembly: U-0.042 (R-25)
- Roof construction assembly: U-0.025 (R-40)
- 40% window-to-wall ratio, no shading
- Fenestration assembly: U-0.30,SHGC-0.40
- Lighting power density = 0.8 W/sf with continuous dimming daylighting controls
- Mechanical: Chilled water cooling system, condensing boiler, designed outdoor air quantities and airflows included in model
- Utility rates based on utility data provided by project team

With these characteristics, the Proposed Case building has an energy cost savings potential of 11.1 % compared the Baseline Case building.

Baseline Case:

Annual Estimated Energy Cost:	$256,053
Site Energy Use Intensity (EUI):	123 kBTU/ft2/yr

Proposed Design:

Annual Estimated Energy Cost:	$227,740
Site Energy Use Intensity (EUI):	104 kBTU/ft2/yr
% Energy Cost Savings:	11.1%
Potential LEED EAc1 Points:	3 points

For reference, an energy model scenario using the optimal solution has been run. This model includes the following design characteristics:

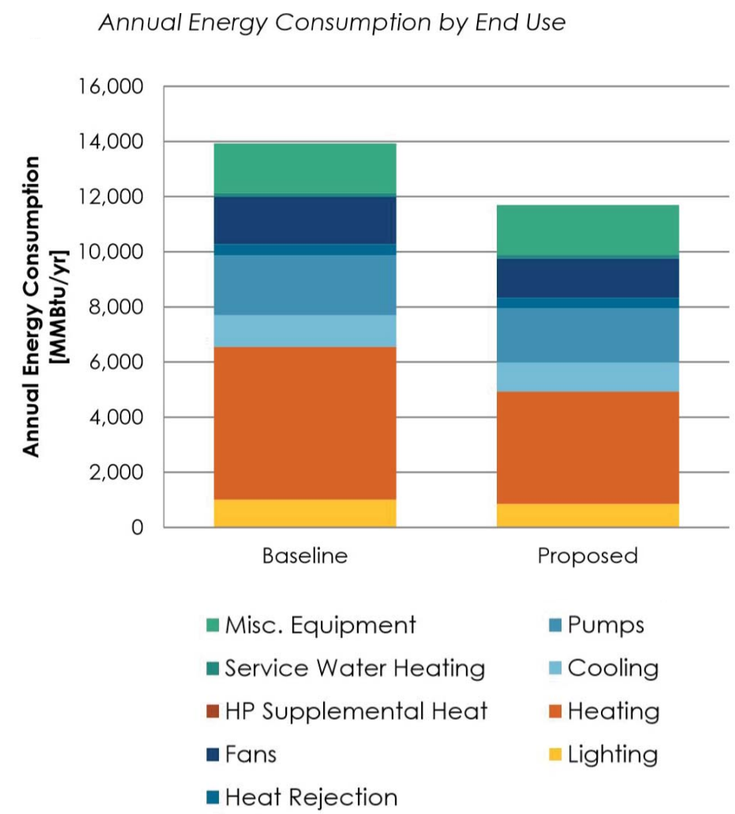
- Exterior wall construction assembly: U-0.037 (R-27)
- Roof construction assembly: U-0.020 (R-50)
- 30% wall-to-wall ratio, 3' shading
- Fenestration: Assembly U-0.30, SHGC-0.40
- Lighting power density = 0.7 W/sf with continuous dimming daylighting controls

Optimal Solution Design:

Annual Estimated Energy Cost:	$217,916
Site Energy Use Intensity (EUI):	99.7 kBTU/ft2/yr
% Energy Cost Savings:	14.9%
Potential LEED EAc1 Points:	5 points

Note that the energy cost savings between the Proposed Case model and Optimal Solution is about $10,000/year. Additionally, for reference and comparison, the existing building has the following performance characteristics:

Total Measured Energy Cost:	$272,127
Site Energy Use Intensity (EUI):	215 kBTU/ft2/yr



While the total energy cost does not significantly change between the existing and Proposed Case building, the building's EUI (actual energy use) meaningfully reduces with the new design. This is because the heating energy use is significantly reduced in the Proposed design; however, because the current natural gas rate is fairly low, the building's utility cost total is not showing as drastic of a change.

SUSTAINABLE DESIGN

The opportunities to build a new dedicated facility for the KDHE affords the project team to consider many significant sustainable strategies to improve the overall operational costs of the new building. As a Department of Environment, there will be significant study given to achieving a sustainable building that would meet the requirements of a LEED Gold or better designation.

Some of the sustainable features that will be incorporated in this facility include the following:
- Passive Design Strategies
- Active Sustainable Design
- Renewable Energy Systems
- Building Materials and Finishes
- Native Landscaping
- Stormwater Management
- Transport Systems

SUSTAINABLE DESIGN

PASSIVE DESIGN STRATEGIES

- Solar controls – sun shading devices, low-e glazing
- Building orientation on site
- Daylight harvesting
- Natural ventilation
- High-albedo roof

RENEWABLE ENERGY SYSTEMS

- PV panels on roof and parking
- Solar water preheat
- Wind generator
- Ground source heat pumps

ACTIVE SUSTAINABLE DESIGN

- High-efficiency mechanical and electrical systems
- Energy recovery system
- Providing water-efficient plumbing fixtures to reduce building water usage by 30%
- Provide energy-recovery practices to increase energy performance by 40%
- Purchase energy efficient freezers
- Provide LED lighting throughout the facility
- Utilize task lights
- Direct/Indirect lighting
- Provide lighting controls (occupancy/vacancy sensors)
- Grouping labs with similar functions near each other to centralize use of common lab equipment - Process cooling water for heat rejection
- Active laboratory air quality management system (Aircuity)
- Active chilled beams in the non-lab spaces
- Separate AHU for lab and non-lab
- Variable speed chillers
- VAV fume hoods with reduced face velocity
- Displacement ventilation

SUSTAINABLE DESIGN

BUILDING MATERIALS + FINISHES

- Utilize sustainable building elements that have a 50+ year lifespan
  - Slate
  - Terracotta
  - Stone
- Low VOC paints and finishes
- Utilize Forest Stewardship's Council certified wood that is responsibly harvested
- Recycled metal for the lab casework

NATIVE LANDSCAPING

- Water efficient landscaping
- Trees to shade parking and roofs
- Views to nature
- Public greenspace with native vegetation

STORMWATER MANAGEMENT

- Pervious pavements
- Bioswales
- Retention pond
- Stormwater collection from roofs + horizontal surfaces
- Green roof (sedum)
- Stormwater collection tank below grade

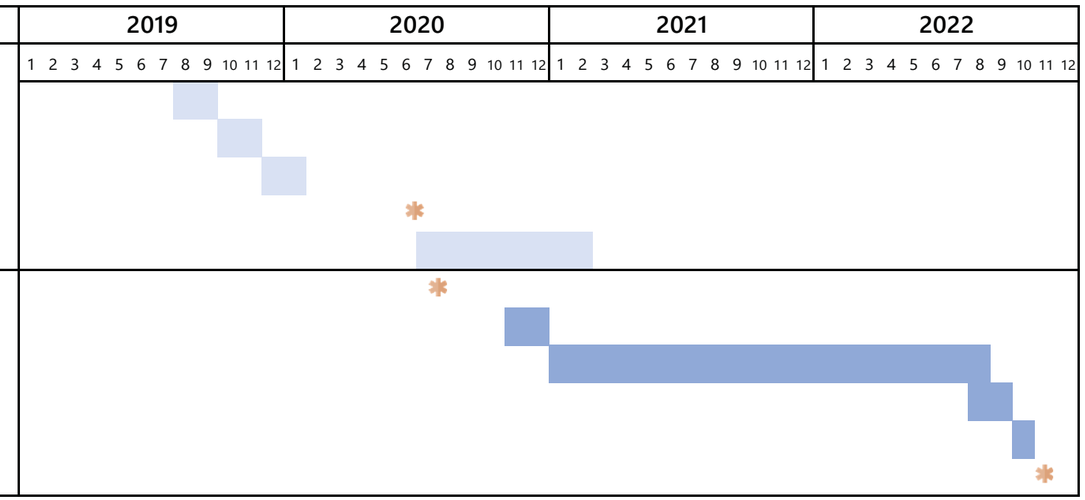
TRANSPORT SYSTEMS

- Provide bike parking spaces
- Electric vehicle charging stations
- Carpool parking
- Shower + changing facilities
- Locate on public transportation lines

PROJECT SCHEDULE

The proposed project schedule below is based on a construction start date of December 2020 and correlates to the escalation factor used in the test fit cost model.

Activity	Duration	Date
Programming	2 Mo.	8/1/19 - 10/1/19
Concept Design	2 Mo.	10/1/19 - 12/1/19
Report	1.5 Mo.	12/1/19 - 1/15/20
Notice to Proceed		7/1/2020
Design	8 Mo.	7/1/20 - 2/28/21
Construction Manager Selection		8/1/2020
GMP Development	1.5 Mo.	11/1/20 -12/15/21
Construction	20 Mo.	12/15/20 - 8/15/22
Equipment Move-In + Installation	1.5 Mo.	8/15/22 - 10/1/22
Commissioning + Certification	1 Mo.	10/1/22 - 11/1/22
Occupancy	0.5 Mo.	11/1/22 - 11/15/22



Design

Construction

2.0

SPACE NEEDS ASSESSMENT

VISION, GOALS + ASSUMPTIONS

VISION

The vision of the KDHE is to provide timely and accurate analytical information for public health benefit in Kansas and to assure the quality of statewide laboratory services through certification and improvement programs.

- The facility should artfully communicate the purpose of this building as the State Health and Environment Laboratory
- A collaborative, interdisciplinary & professional culture should be apparent
-The facility should include cutting-edge laboratories which support flexibility and safety

GOALS

The goals for this effort include the following:
- Increase Sample Flow
- Improve Employee Recruitment & Retention
- Achieve More Efficient + Contemporary Laboratories
- Improve Site Security
- Consolidate MEP Systems and Improve Maintainability + Reliability
- Increase High Security Biological Laboratory (BSL-3) Space and Workflow
- Improve Life Safety
- Integrate Sustainable Building + Energy Efficient Design
- Provide Training Laboratory Space
- Improve Gas Cylinder Storage + Delivery
- Incorporate Surge Space
- Plan for Future Growth Capacity

In addition, each of the departmental units of the KDHE prepared project goals specific to their needs which were gathered in a programming questionnaire located in the Appendix.

ASSUMPTIONS

The KDHE Laboratory assumes a growth of 20 staff over the course of the next 5-10 years.

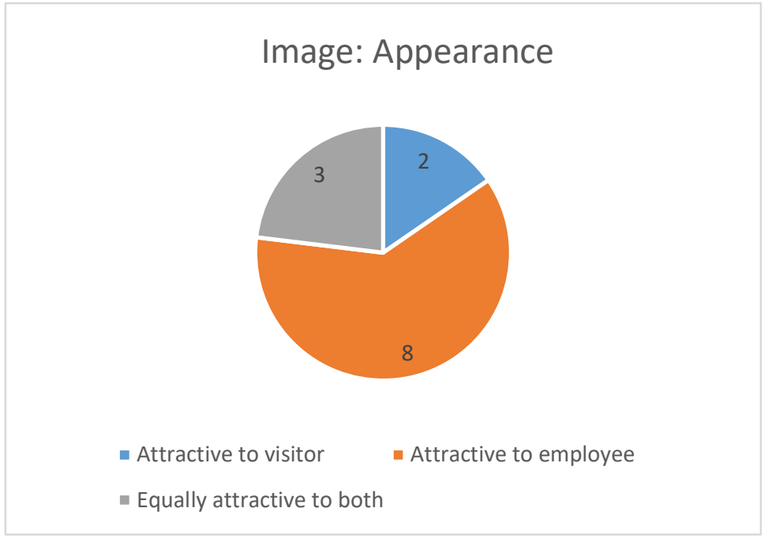
The laboratory module is based on 11′ x 33′ which affords flexibility while providing opportunities for efficiency improvements in the operations and construction of this new laboratory.

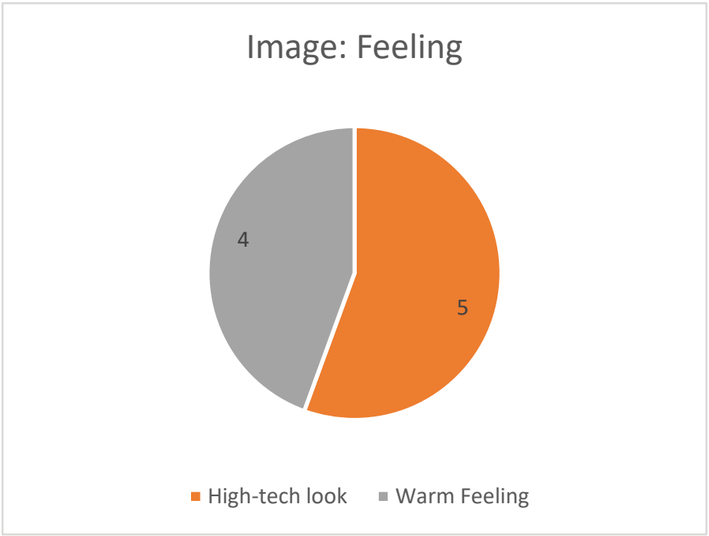
The team looked at 3 potential sites to provide the KDHE with the space for a new lab building to accomplish its vision and goals.

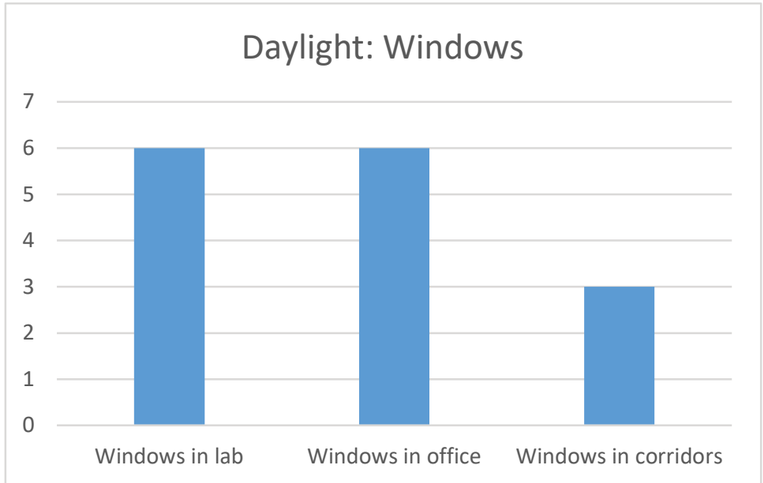
The construction method is assumed to be Construction Management at Risk.

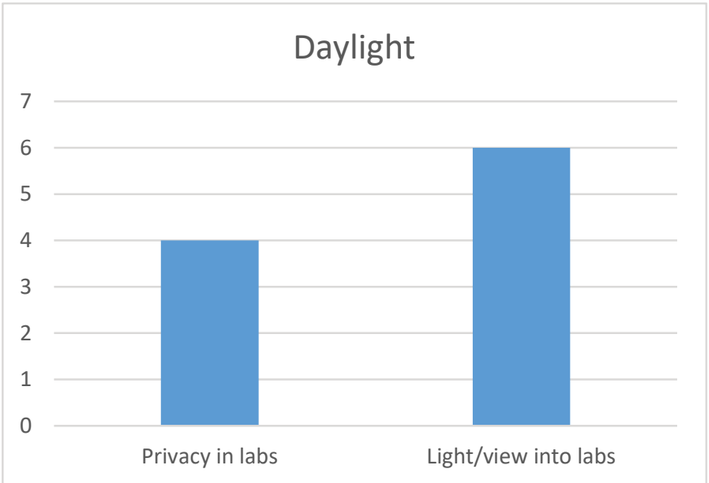
PROJECT GOALS

When starting to think about preferences and goals for the new KDHE laboratory, department leaders were brought in to begin the discussion. The graphics shown here represent a grouping of questions that were asked of the KDHE staff, and their answers were considered when continuing the design process. The original questionnaires and answers are attached in Appendix C.

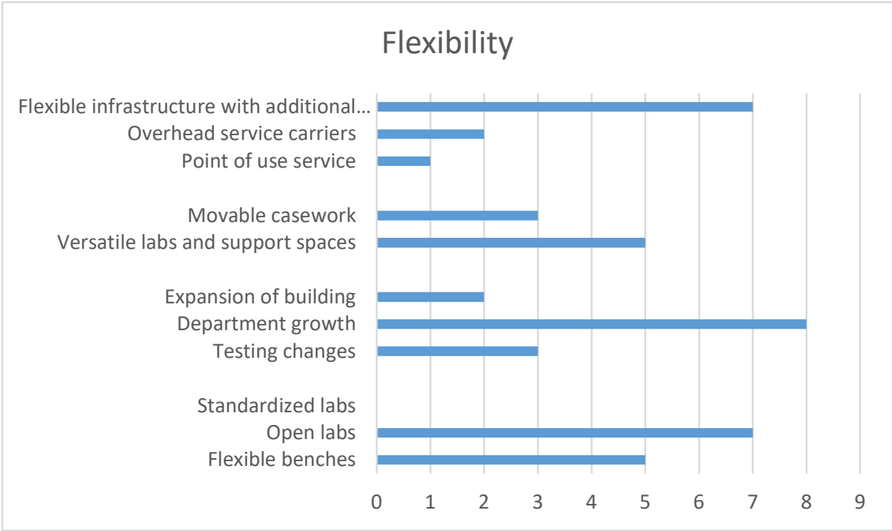


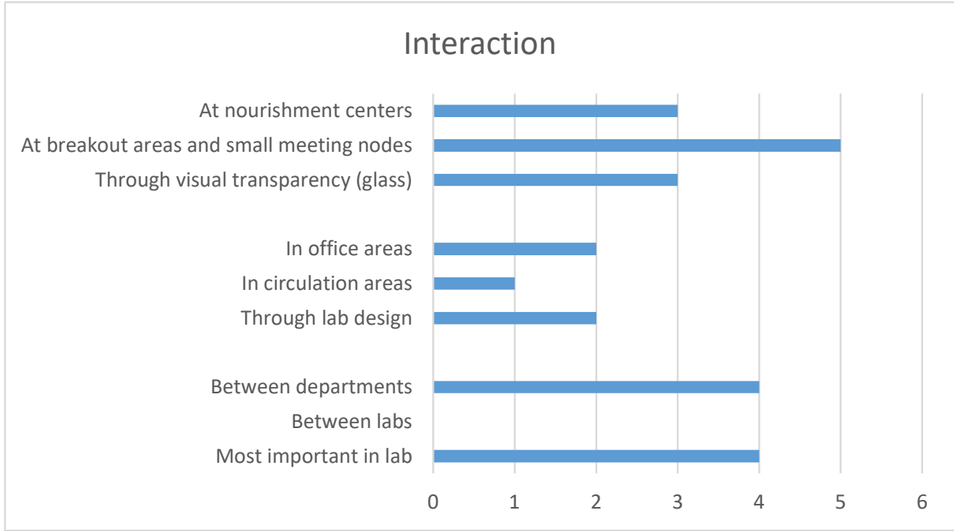


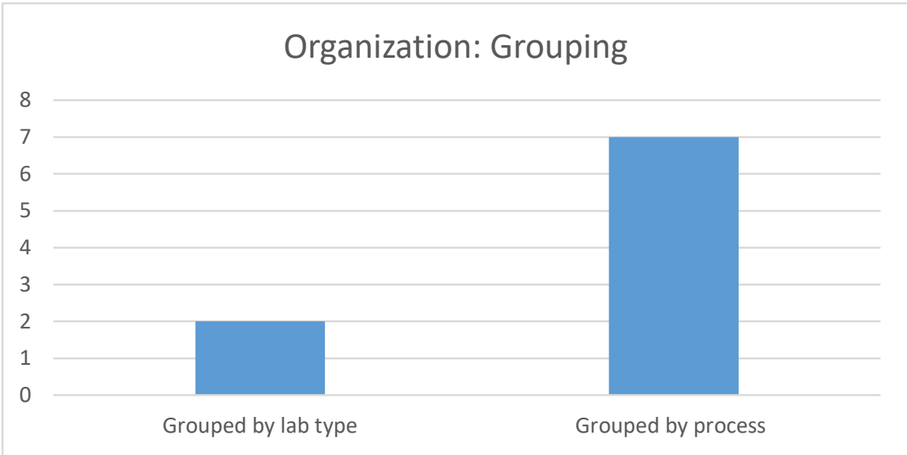


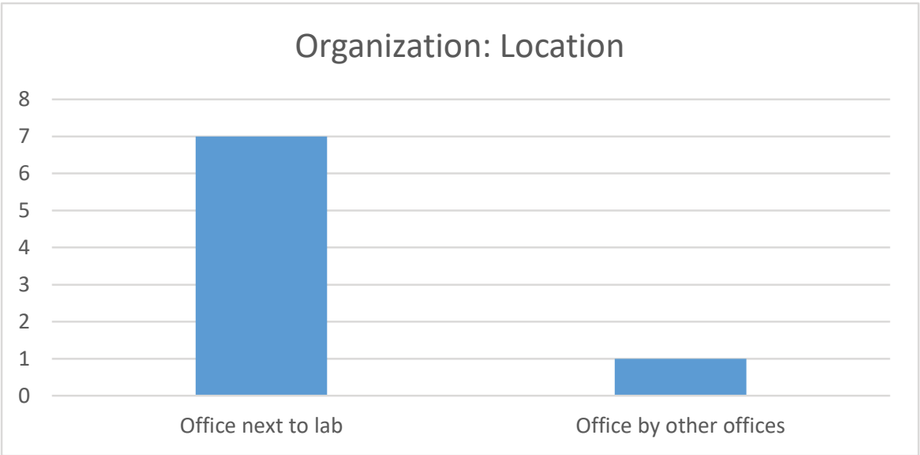


PROJECT GOALS









EXISTING SPACE CONDITION ASSESSMENT IN NET SQUARE FEET (NSF)

EXISTING CONDITION

A space condition assessment was conducted as part of the conceptual design and programming study for the Kansas Department of Health and Environment. This assessment places all NSF into three different condition categories of Acceptable, Needs Renovation and Does Not Support Function. A thorough analysis of the facility will also be completed by APHL and is included in the Appendix.

Based on this analysis only 16% of the current assignable space is acceptable for its current function. Additionally, 84% of the existing facility is in need of renovation or replacement and is therefore in dire need of replacing.

Customer Service space was evaluated using the following criteria:
- Condition of finishes and furnishings
- Space utilization and flexibility
- Environmental control
- Technology

Laboratory space was evaluated using the following criteria:
- Condition of finishes and furnishings
- Space utilization and flexibility
- Placement of safety apparatus
- MEP systems
- Technology

Office and Meeting Support space was evaluated using the following criteria:
- Condition of finishes and furnishings
- Space utilization

Maintenance and Housekeeping space was evaluated using the following criteria:
- Condition of finishes and furnishings
- Space utilization

Existing KDHE Space Condition	Equivalent NSF	Condition %
Acceptable	10,225.50	16%
Needs Renovation	25,182	39%
Does Not Support Function	29,065.50	45%
Total	**64,473**	**100%**

KDHE Space Condition Equivalent NSF and Percentage

Space Types	Current NSF Totals	Acceptable	Needs Renovation	Doesn't Support Function
Receiving + Accessioning	12,531	10%	40%	50%
Health Chemistry	3,808	5%	35%	60%
Virology + Serology	3,985	15%	30%	55%
Diagnostic Microbiology	5,703	10%	30%	60%
BSL-3	817	0%	0%	100%
Organic Chemistry	6041	15%	45%	40%
Inorganic Chemistry	8,474	10%	30%	60%
Offices + Building Support	17745	30%	45%	25%
Maintenance + Housekeeping	5,369	10%	50%	40%
Total	**64,473**	**16%**	**39%**	**45%**

KDHE Space Condition by Percentage

RIGHTSIZING + PROJECTED NSF

DEPARTMENTAL NSF

In order to establish a baseline for current and future space needs for KDHE, multiple meetings were held with each department to determine what currently exists, what currently works and what needs to improve. One of the first steps in the process was comparing existing space utilization to current best practices.

The Clark Enersen Partners spent a number of days observing the lab staff perform their work trying to understand what inefficiencies were resulting from the current building layout. Improvements to departmental flows were discovered and developed through interactive design workshops with the lab staff. A list of the existing spaces was developed to see what spaces could be combined, eliminated, or reconfigured to improve overall efficiencies.

The result is that the new KDHE laboratory building can accommodate 20 more staff (from 60 to 80) in 3,455 net square feet less than what they currently occupy. This is due to developing the plans on a lab module of 11′ x 33′ which provides maximum efficiency of effective lineal feet of bench and equipment space for the instruments, prep and equipment functions, while providing appropriate personnel flow throughout.

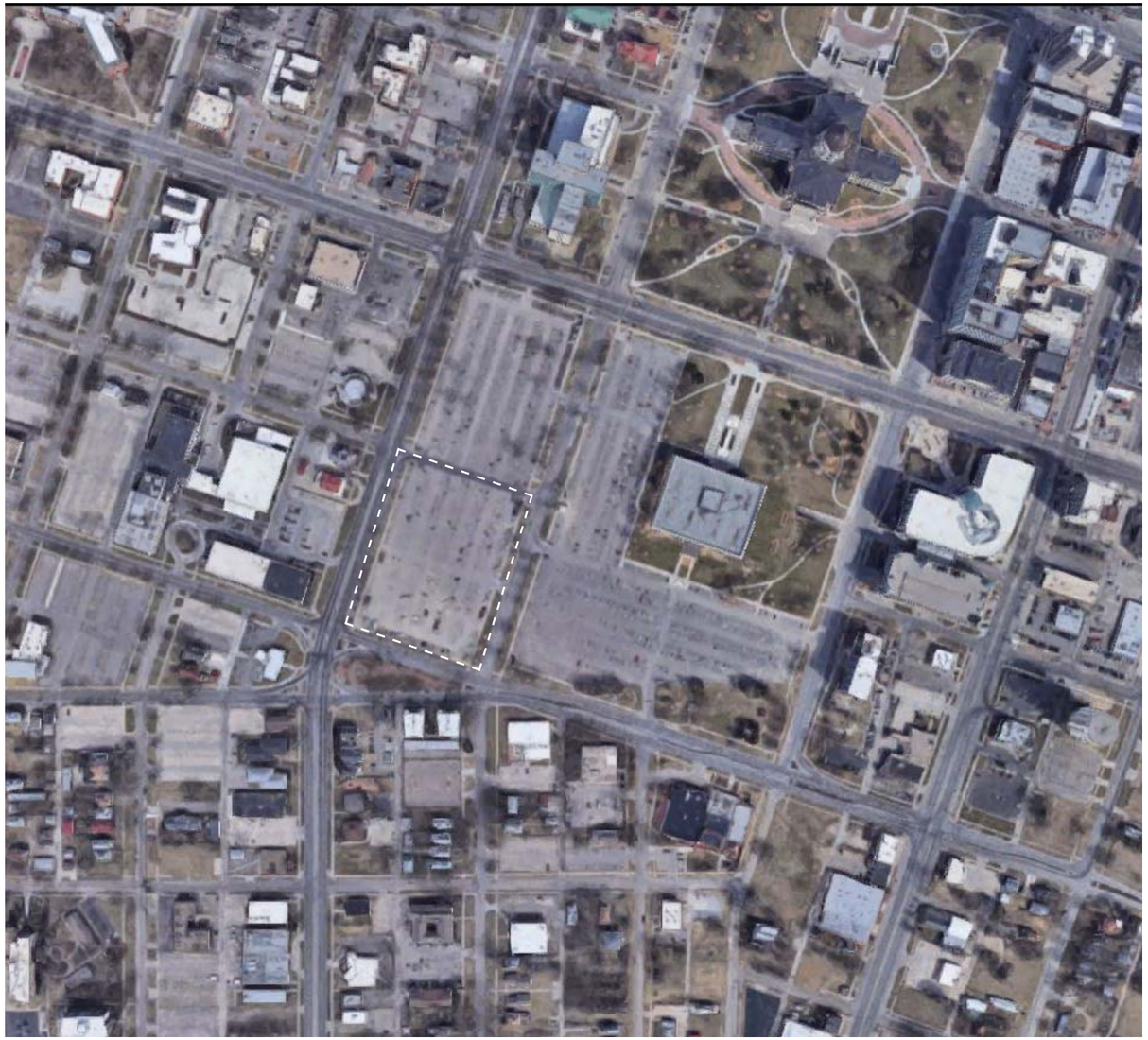
Improving upon the net square feet efficiencies is the overall efficiency of the building. The current building is just over 120,000 gross square feet and the projected laboratory building is only 100,000 gross square feet. The only department to see any significant increase was the BSL-3 lab which is currently undersized for the function. Additionally, the lab groups have worked together to combine their molecular diagnostic functions into a shared PCR core lab.

3.0

SITE ANALYSIS

DOWNTOWN SITE SIGNIFICANCE

The downtown site is the ideal location for the future of KDHE. This site is located two blocks from the Capitol Building and is in the heart of the State of Kansas capitol grounds. There are numerous state agencies in the vicinity of this site. The downtown location provides a plethora of amenities within walking distance. Shopping, restaurants and fast food are among many of the conveniences that come with this location. When it comes to commuting, walking, biking, riding the bus, driving, Kansas Van Pool Program and Rideshare from Kansas City or Lawrence are all options available at this site. In terms of employee recruitment and retention, the downtown site is a desirable work location for future prospects of KDHE.



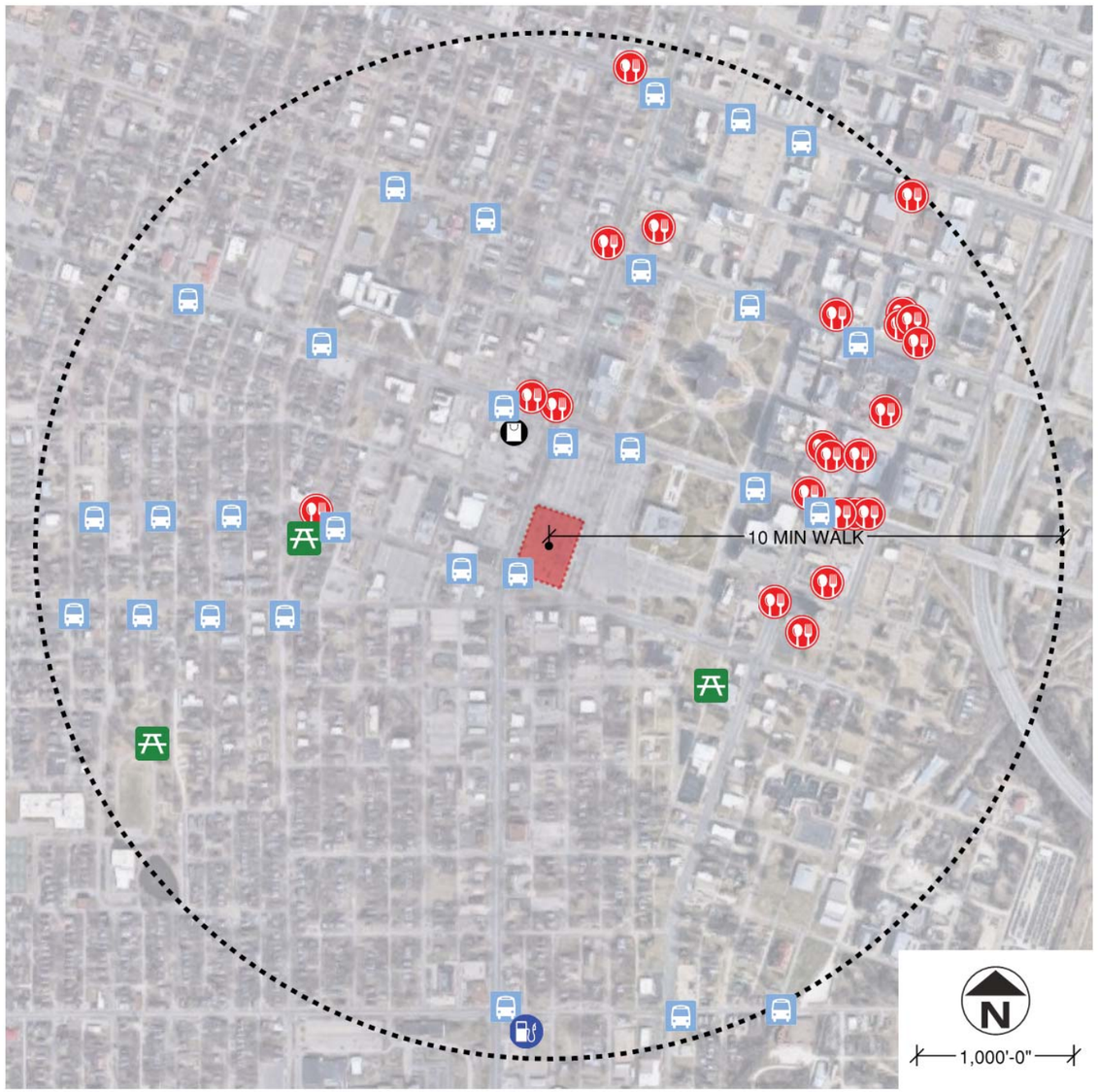
KNI SITE SIGNIFICANCE

The KNI site is an excellent location for the future of KDHE. This site is located blocks from Washburn University and KBI Forensic Science Center. The location provides amenities such as shopping, restaurants, fast food and public parks. When it comes to commuting, walking, biking, riding the bus, driving, and Rideshare from Kansas City or Lawrence are all options available at this site. The close proximity to Washburn University will provide opportunities for prospective interns and employee recruitment.

FORBES SITE SIGNIFICANCE

The site is adjacent to the current location of KDHE. This site is located just west of the Topeka Regional Airport. The close proximity to the existing power plant could allow for the tie-in of services for the future building.

DOWNTOWN PEDESTRIAN ZONE

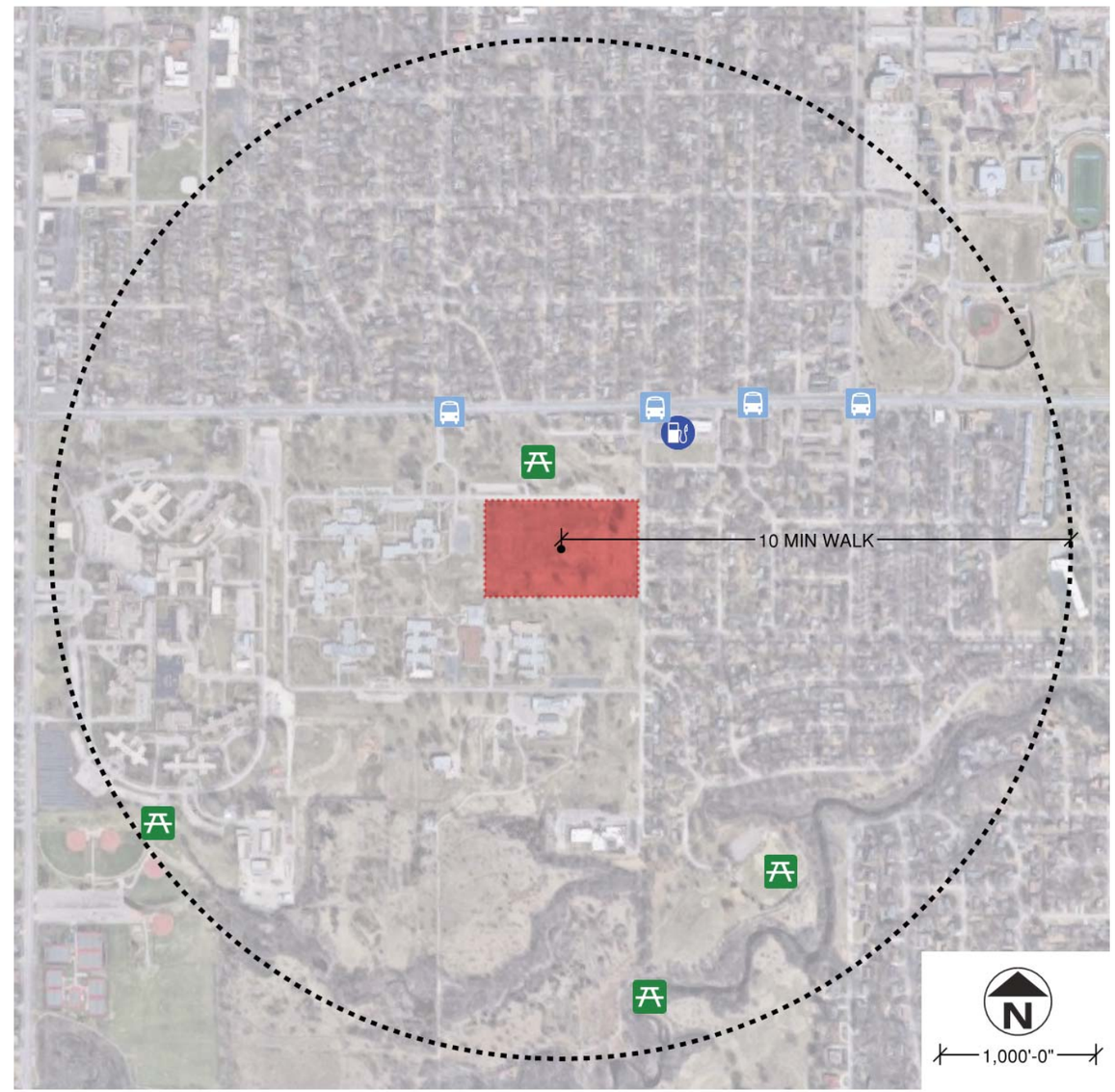


The downtown site provides the pinnacle in location for amenities within a 10-minute walking radius. Restaurants, fast food, public parks, shopping and other conveniences can all be enjoyed within a walk over lunch or during a break. Houses and apartments in the area would also provide employees opportunities to walk to work.

- Restuarant / Fast Food / Coffee
- Gas Station / Convenience Store
- Shopping / Grocery Store
- Bus stop
- Public Park

KNI PEDESTRIAN ZONE

The KNI site provides some amenities within a 10-minute walking radius. Public parks and a convenience store can all be visited within a walk over lunch or during a break. Restaurants and fast food are located just outside the 10-minute walking radius. Houses and apartments in the area would also provide employees opportunities to walk to work.



Restuarant / Fast Food / Coffee

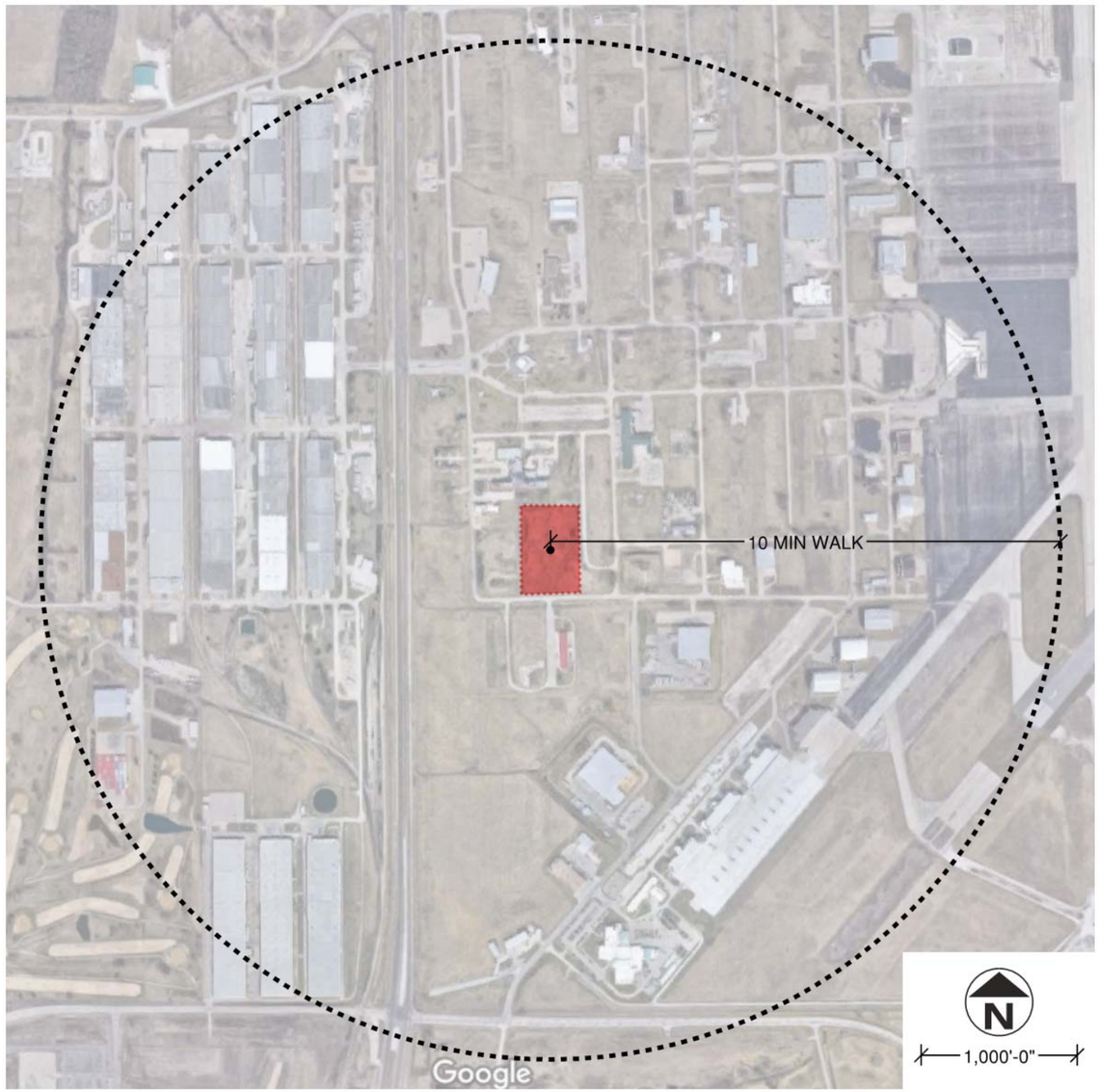
Gas Station / Convenience Store

Shopping / Grocery Store

Bus stop

Public Park

FORBES PEDESTRIAN ZONE



The Forbes site provides no amenities within a 10-minute walking radius. There is one location for fast food located just outside the walking radius.

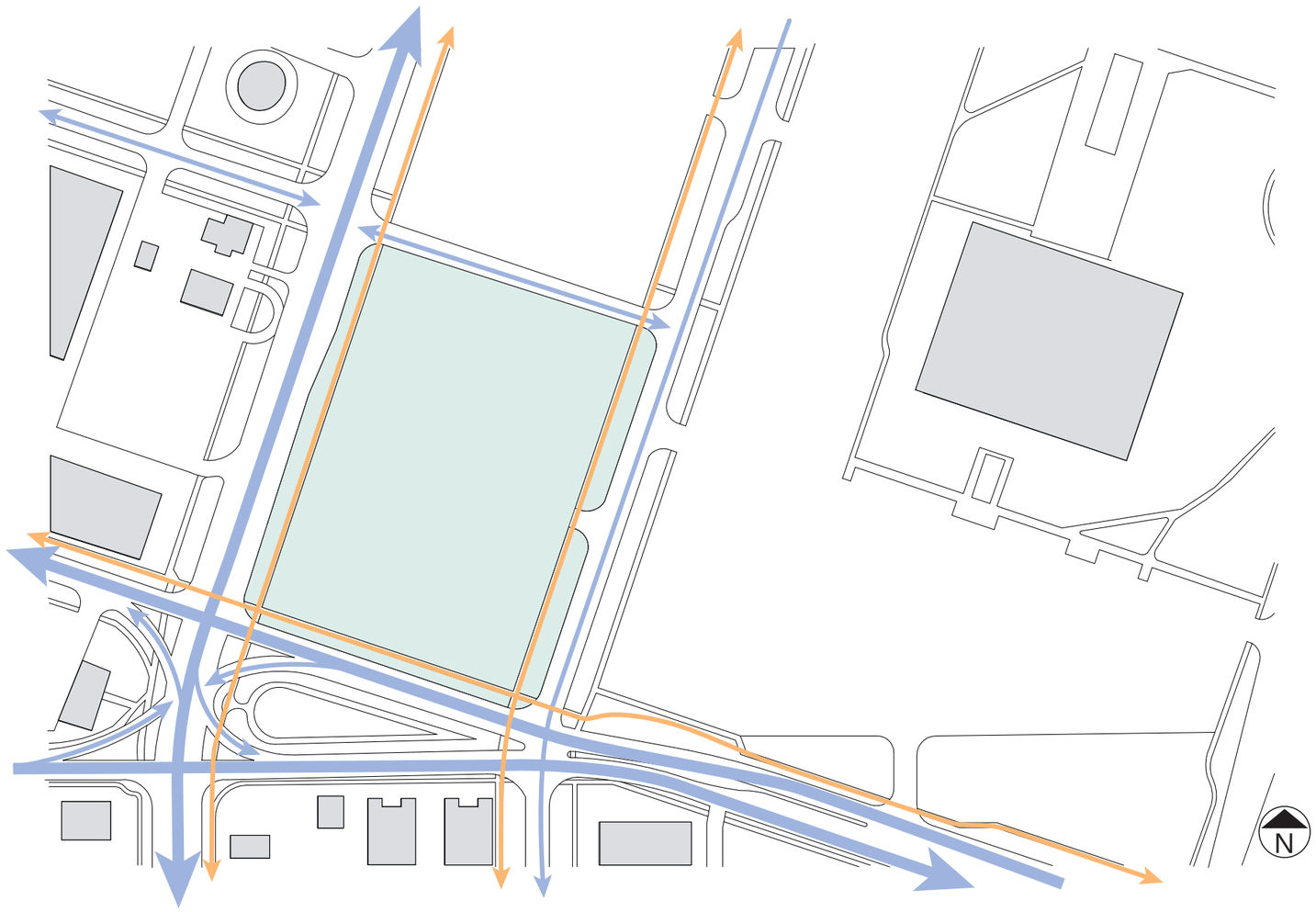
- Restuarant / Fast Food / Coffee
- Gas Station / Convenience Store
- Shopping / Grocery Store
- Bus stop
- Public Park

PRIMARY PEDESTRIAN + VEHICULAR PATHWAYS

DOWNTOWN SITE

Major pathways for the downtown site and immediately adjacent spaces are shown on this page. As future development occurs among the existing State-run facilities, current walk-ability for both employees and visitors should be enhanced. Site explorations found in this study have taken pedestrian pathways into account as infrastructure that supports activity and viability of downtown.

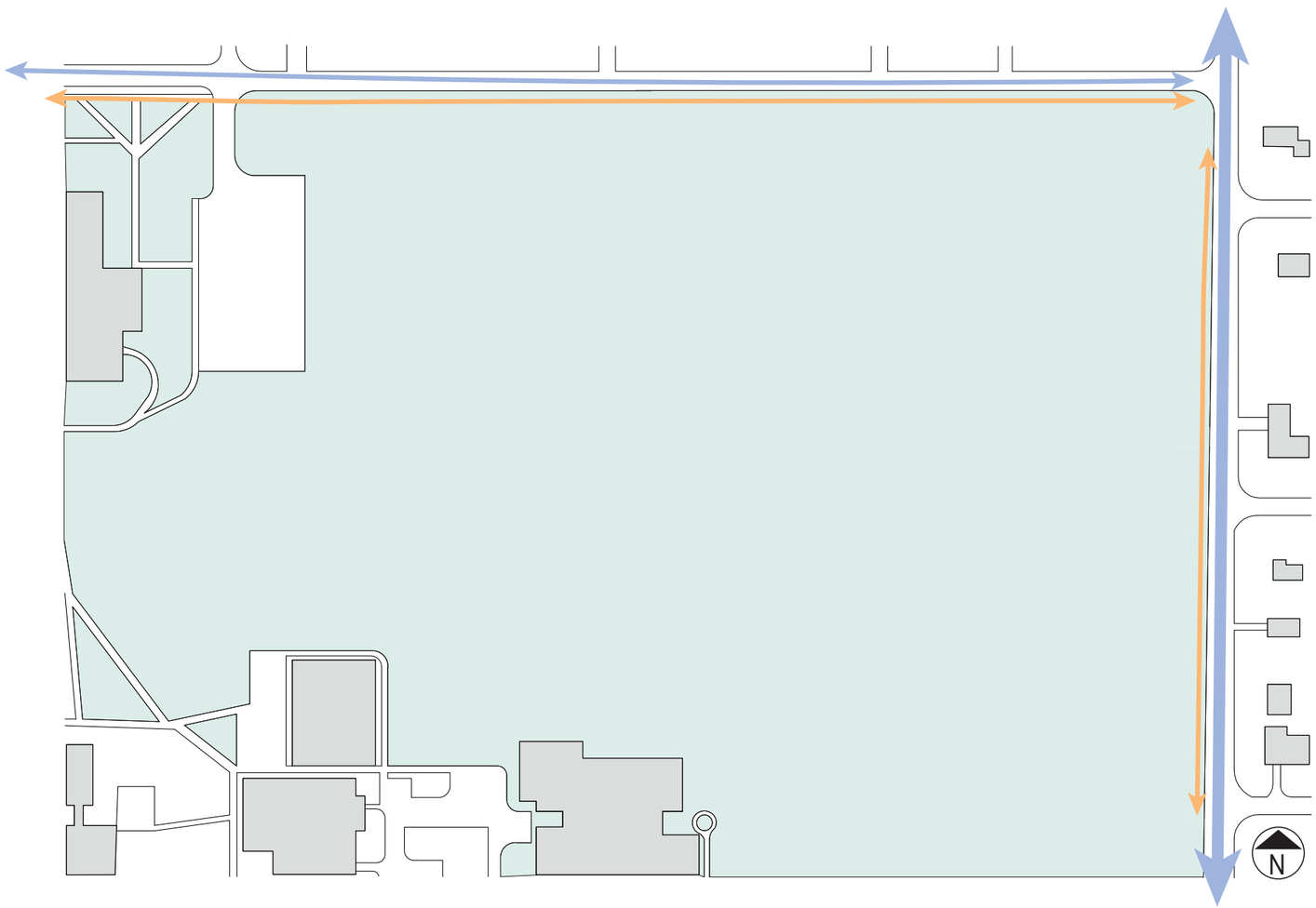
Just as pedestrian pathways must be taken into account to best serve the needs of state employees and visitors, vehicular pathways must be maintained in order provide safe routes on and around the site, service to the building, and balance of convenience versus adherence to the urban fabric already in place. The pathways represented follow the current downtown plan.



Vehicle Circulation

Pedestrian Circulation

PRIMARY PEDESTRIAN + VEHICULAR PATHWAYS



KNI SITE

Major pathways for the KNI site and immediately adjacent spaces are shown on this page. Site explorations found in this study have taken pedestrian pathways into account as infrastructure that supports activity and viability of the surrounding area.

Just as pedestrian pathways must be taken into account to best serve the needs of state employees and visitors, vehicular pathways must be maintained in order provide safe routes on and around the site and service to the building. The pathways represented follow the current site plan.

Vehicle Circulation

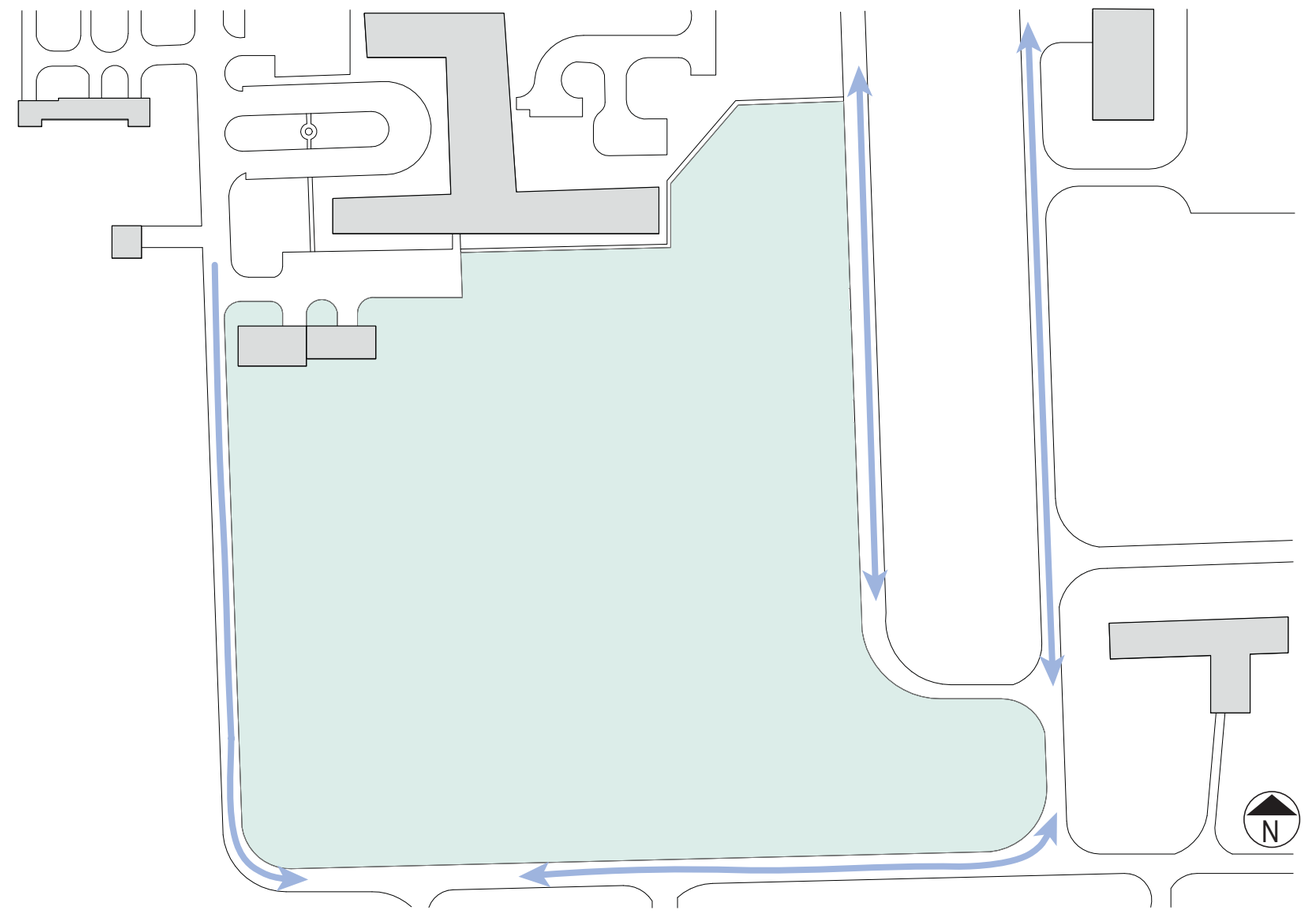
Pedestrian Circulation

PRIMARY PEDESTRIAN + VEHICULAR PATHWAYS

FORBES SITE

Major pathways for the Forbes site and immediately adjacent spaces are shown on this page. Site explorations and information found in this study have determined that pedestrian pathways are not sufficiently part of the infrastructure of the surrounding area currently.

Just as pedestrian pathways must be taken into account to best serve the needs of state employees and visitors, vehicular pathways must be maintained in order to provide safe routes on and around the site and service to the building. The pathways represented follow the current site plan.



Vehicle Circulation

Pedestrian Circulation

4.0

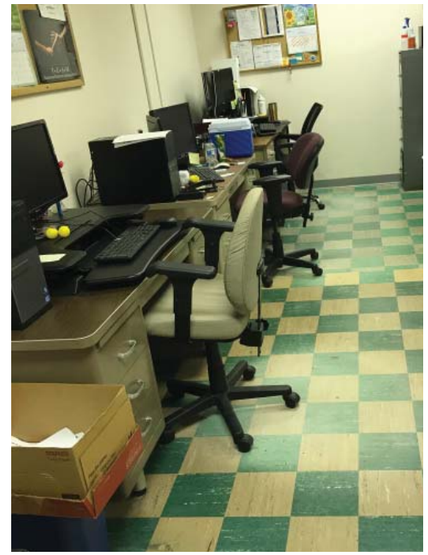
DESIGN CRITERIA

EXISTING BUILDING CONDITIONS

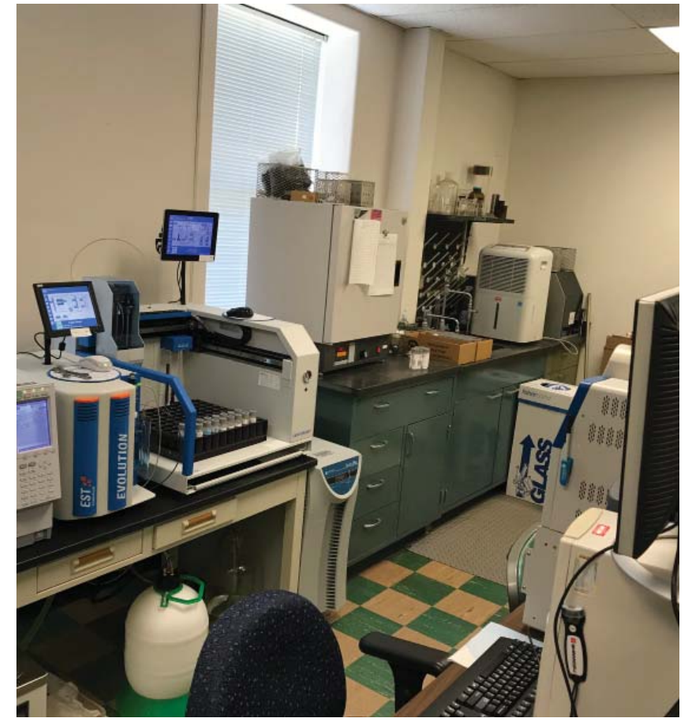
The KDHE has a strong history and presence in the State of Kansas. The current lab facility is located in a former hospital built in the 1950's and re-purposed in the 1970's for the lab. The facility has seen some further upgrades throughout the subsequent 40 years as new programs have come on line and new technology incorporated. Only the minimal renovation to the hospital was completed to provide a functioning lab environment. There is no consistency in flooring, wall finishes, lighting levels, and laboratory casework and fume hoods. It is difficult to provide the flexibility needed to accommodate improvements in testing and analytical equipment.

To accommodate the laboratory in the space, many groups and lab functions are separated by walls and other barriers which do not afford efficient sample flow. The location of the building at Forbes Field does not provide nearby amenities for staff recruitment/retention. The site security could be improved with more stand-off barriers and cameras.

The building, while well maintained, has consistent issues resulting from the advancing age of the facility. Many of these issues result in potential employee safety concerns. The building MEP systems are not adequate for modern lab environments and do not include the appropriate energy efficiency enhancements that are standard in new facilities. The BSL-3 lab and outbreak lab spaces do not meet current BMBL requirements, and the Customer Services group is divided up into a number of spaces throughout the facility.



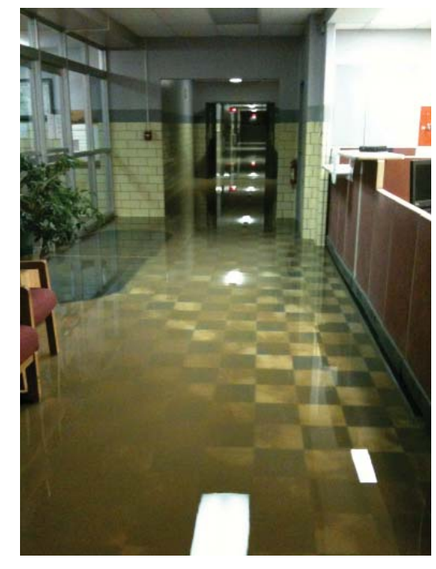
PERISHABLE

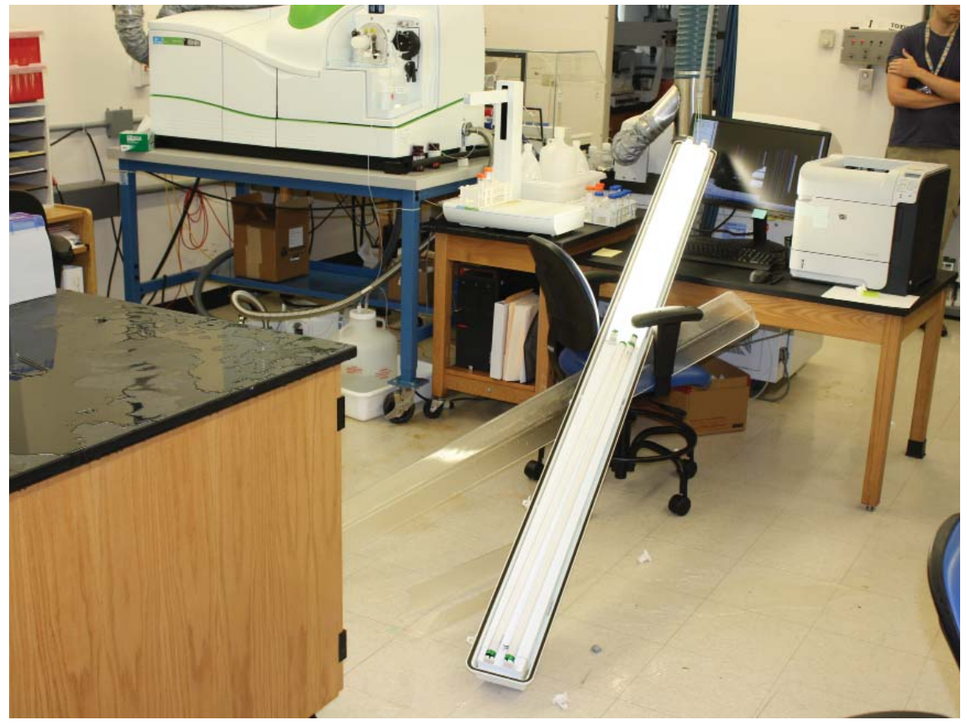

EVOLUTION
GLASS

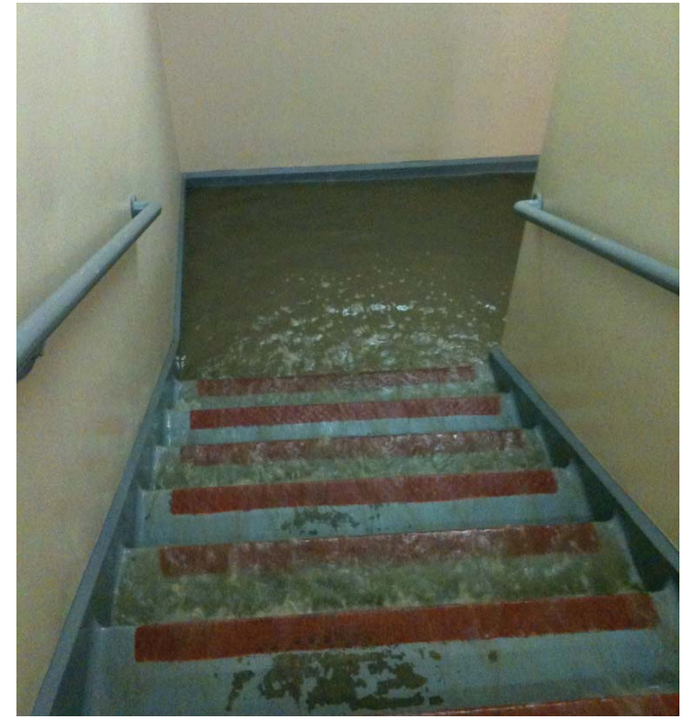
The age of the building has brought about issues in the function of normal laboratory operations. There has been drainage back-ups in the facility that have caused flooding and required major interior construction work. There have been pipes that have simply corroded and fallen into the lab space below. A recent issue occurred when a light fixture fell onto a laboratory workstation during work hours where someone had been sitting moments before. Elevators are consistently under repair and in many instances are not operating.

While the maintenance team does their best to keep the building functioning for the lab purposes, the building has more than completed its useful lifespan of 50 years. It is to a point now, that the State should strongly consider a new laboratory building which can meet the goals of the department be built.

Some of these project goals include:
- Increase Sample Flow
- Improve Employee Recruitment & Retention
- Achieve More Efficient & Contemporary Laboratories
- Improve Site Security
- Consolidate MEP Systems and Improve Maintainability / Reliability
- Increase High Security Biological Laboratory (BSL-3) Space and Workflow
- Improve Life Safety
- Integrate Sustainable Building & Energy Efficient Design Elements
- Incorporate Surge Space
- Plan for Future Growth Capacity

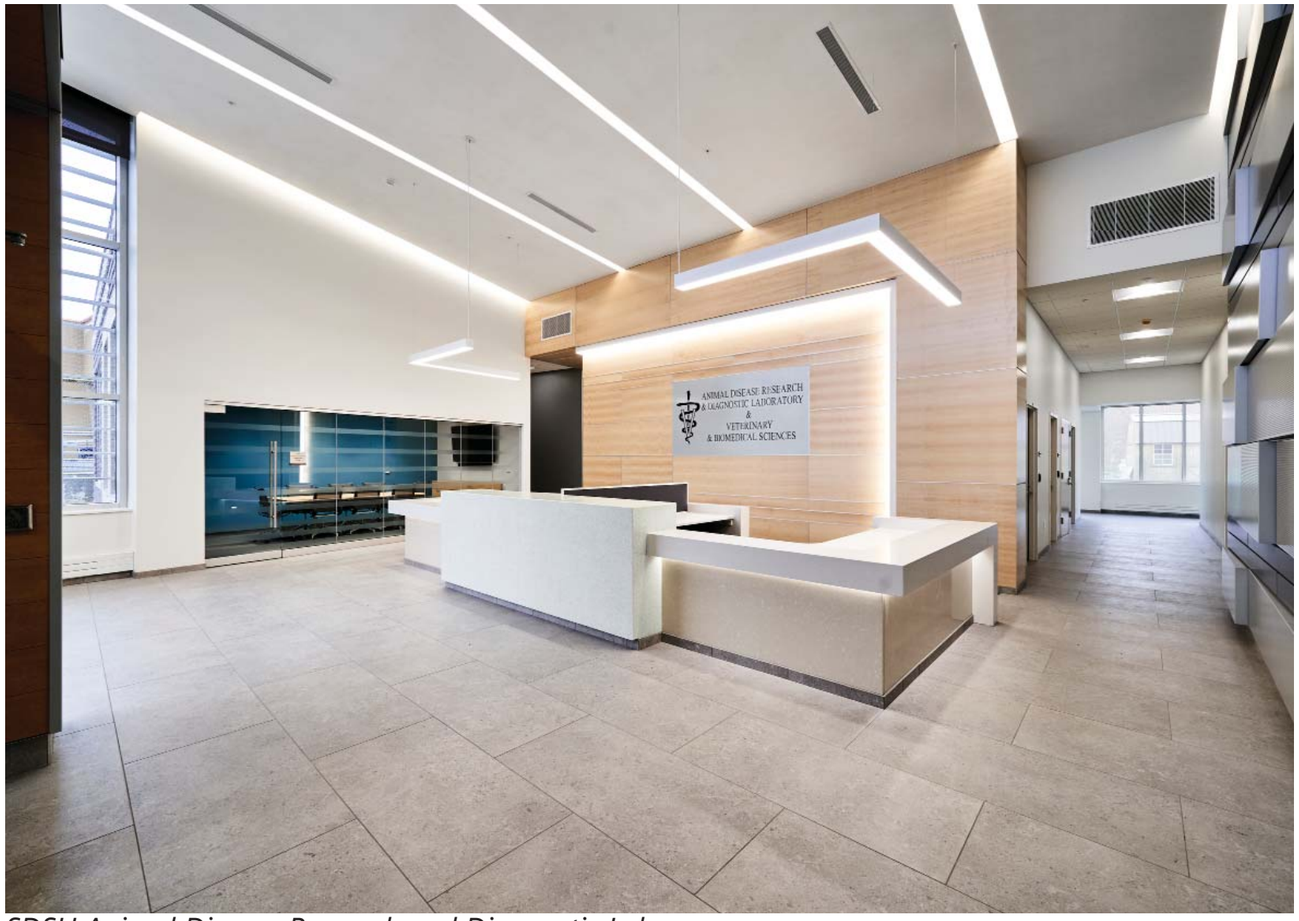






RECEIVING, ACCESSIONING + CUSTOMER SERVICE SPACES

Example diagrams are shown on the following pages that represent room layouts for receiving, accessioning, and customer service spaces. The diagrams fit with space projections anticipated for KDHE in order to achieve space utilization similar to other peer institutions.

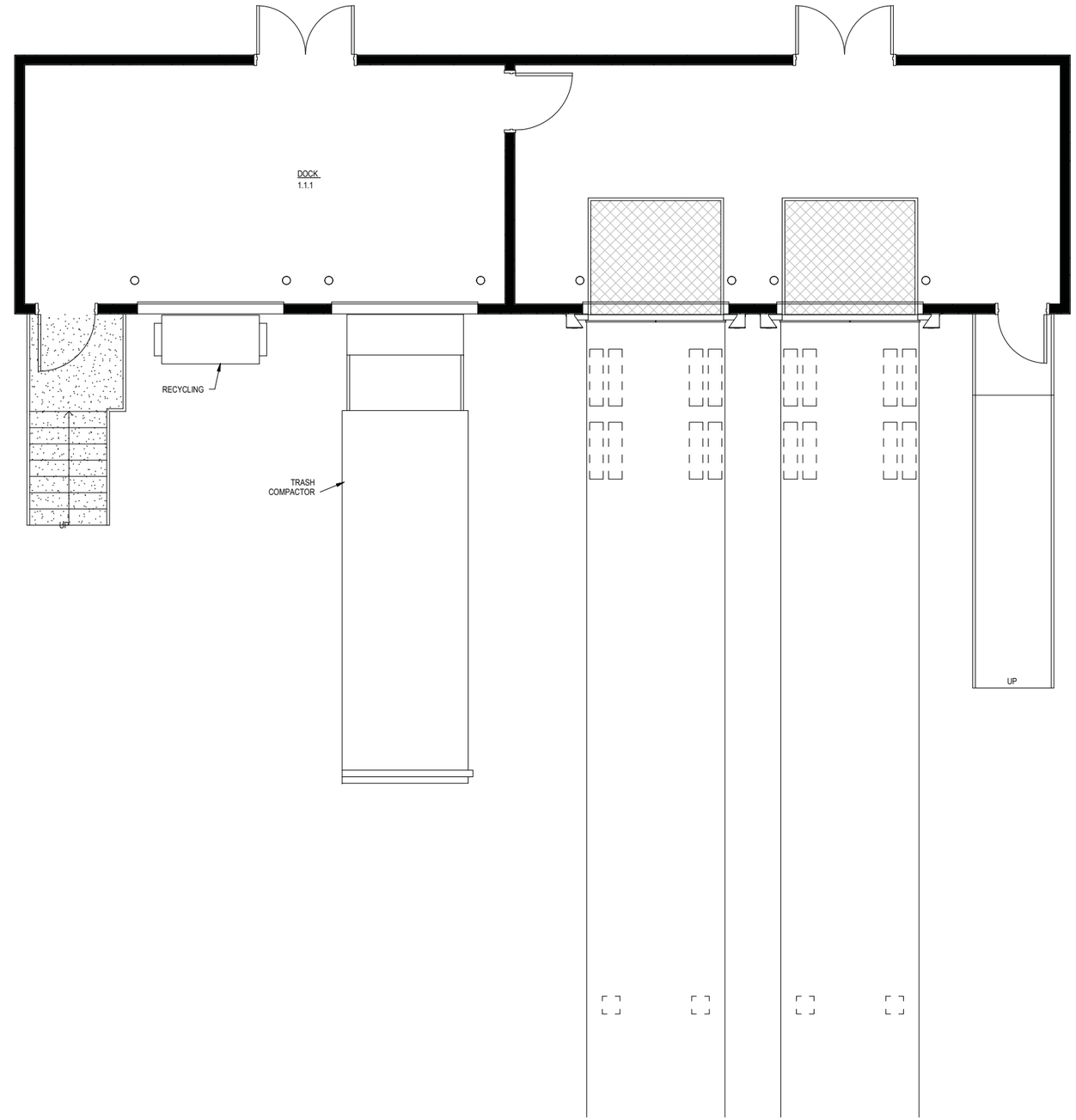


SDSU Animal Disease Research and Diagnostic Lab

EXIT

CUSTOMER SERVICE SPACES

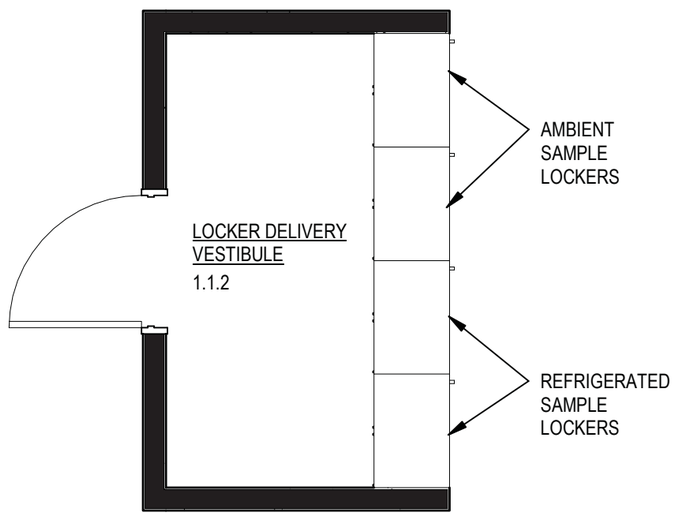
DOCK
750 NSF
Quantity: 1
750 NSF Total



CUSTOMER SERVICE SPACES

LOCKER DELIVERY VESTIBULE

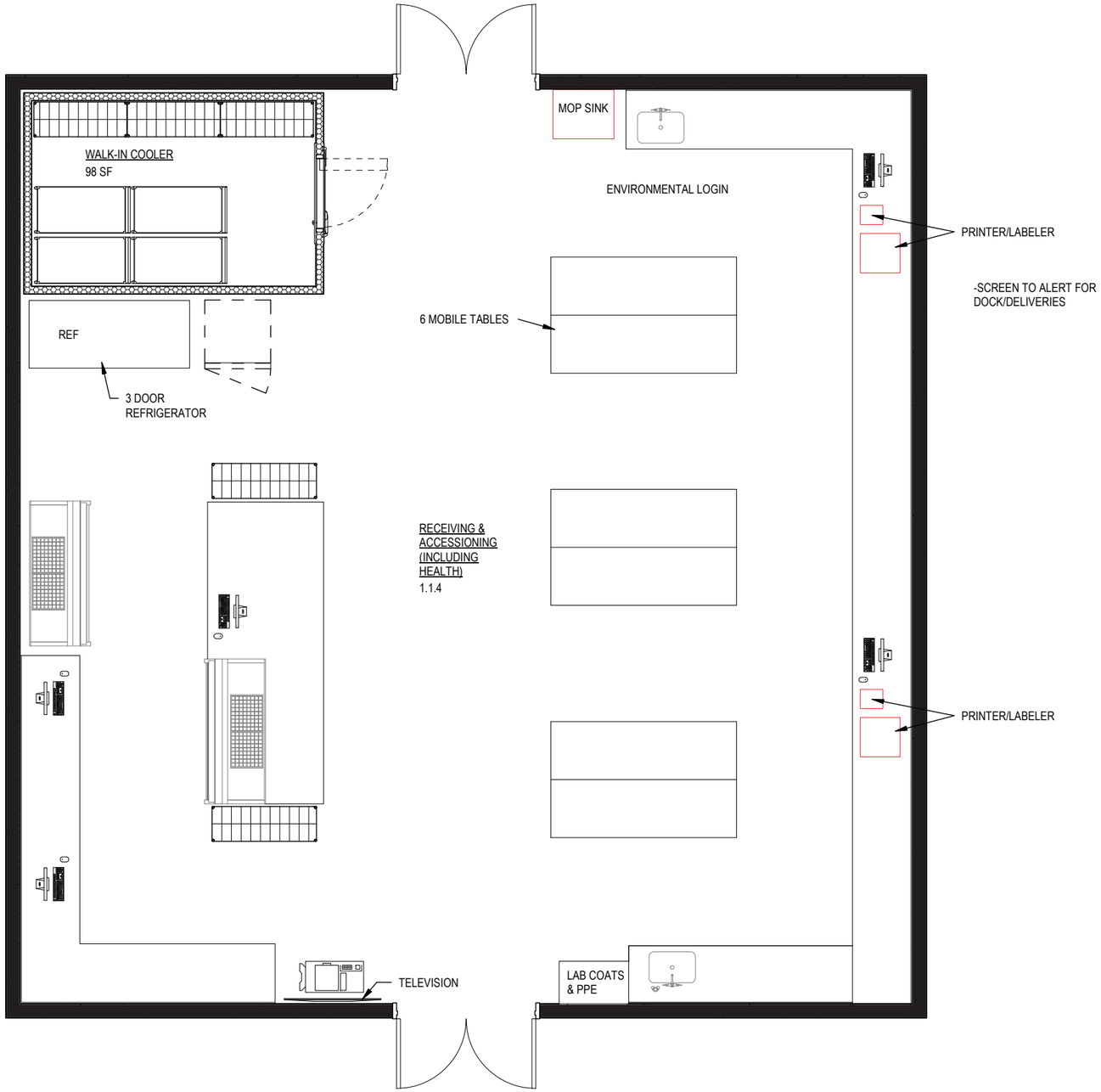
100 NSF
Quantity: 1
100 NSF Total



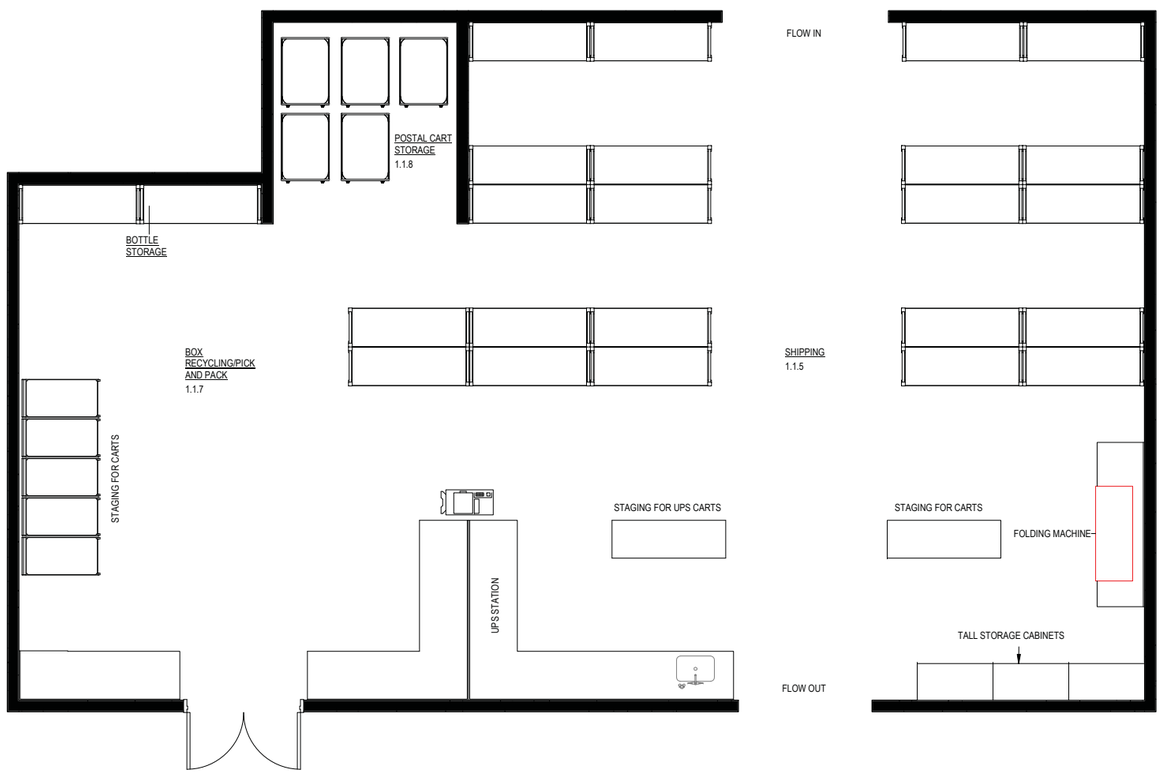
CUSTOMER SERVICE SPACES

RECEIVING + ACCESSIONING

1,500 NSF
Quantity: 1
1,500 NSF Total



CUSTOMER SERVICE SPACES



SHIPPING
1,300 NSF
Quantity: 1
1,300 NSF Total

BOX RECYCLING, PICK + PACK
600 NSF
Quantity: 1
600 NSF Total

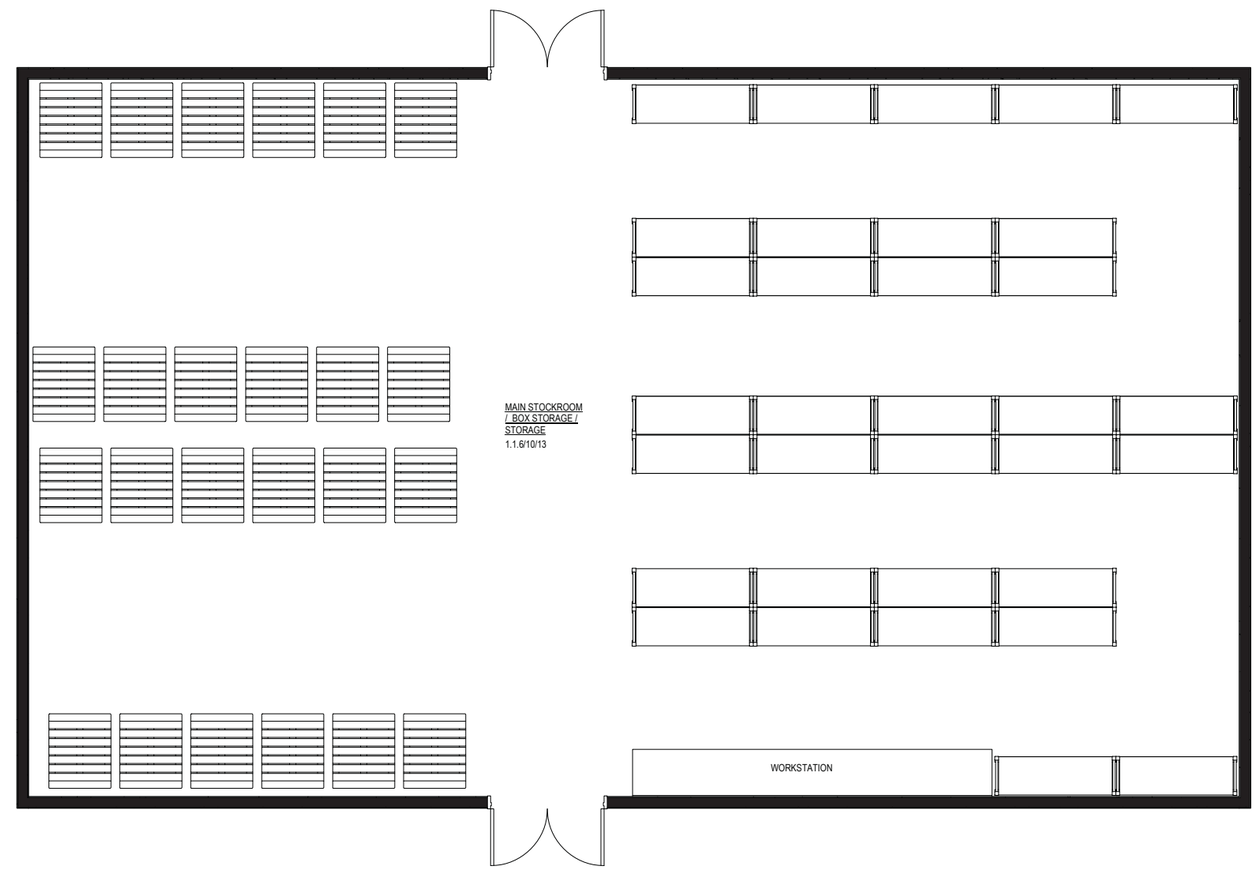
POSTAL CART STORAGE
100 NSF
Quantity: 1
100 NSF Total

CUSTOMER SERVICE SPACES

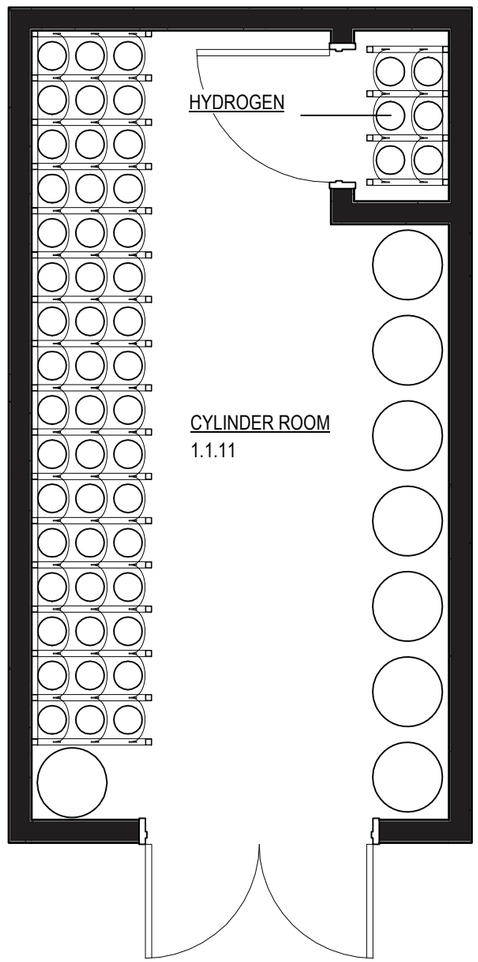
BOX STORAGE
300 NSF
Quantity: 1
300 NSF Total

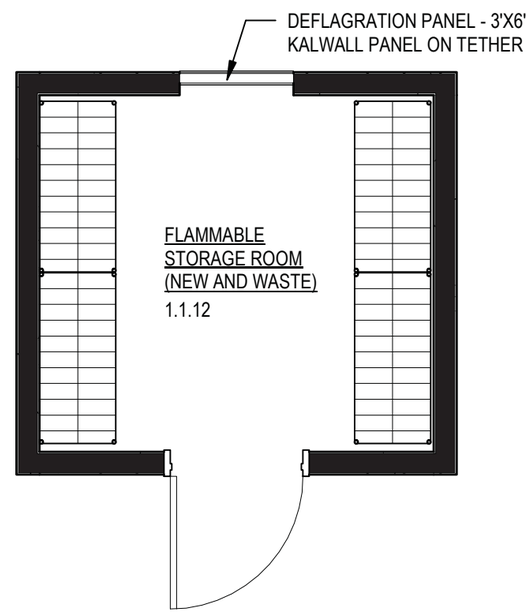
MAIN STOCKROOM
2,000 NSF
Quantity: 1
2,000 NSF Total

STORAGE
300 NSF
Quantity: 1
300 NSF Total



CUSTOMER SERVICE SPACES



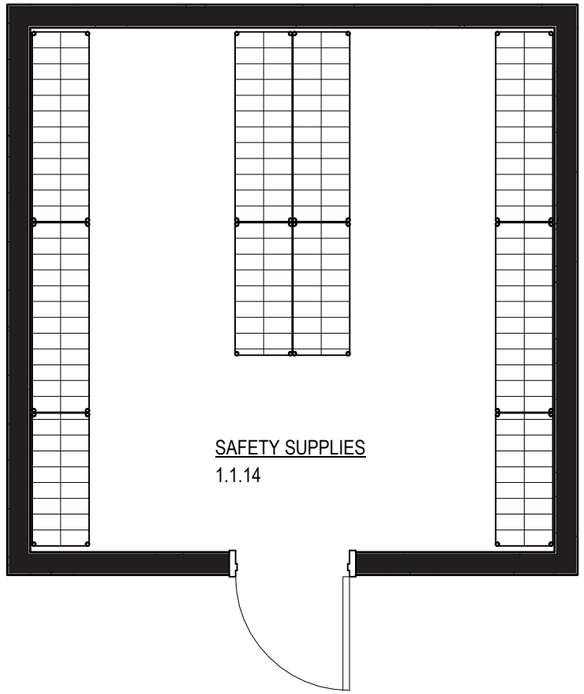


CYLINDER ROOM
230 NSF
Quantity: 1
230 NSF Total

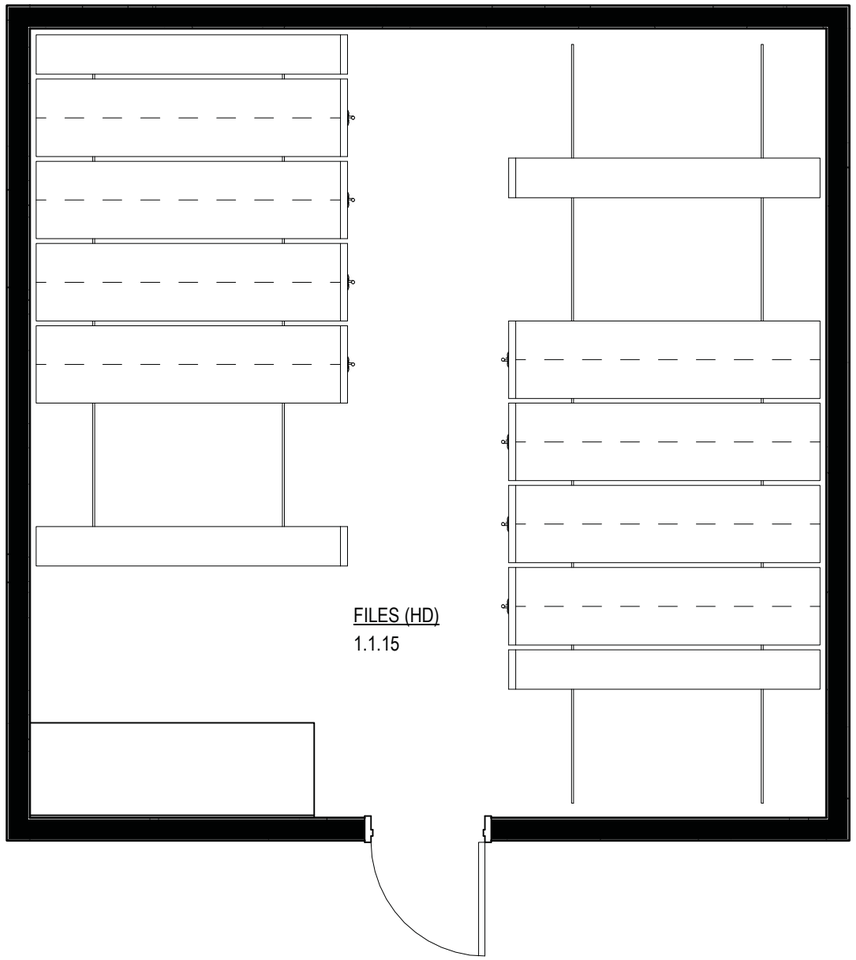
FLAMMABLE STORAGE
100 NSF
Quantity: 2
200 NSF Total

CUSTOMER SERVICE SPACES

SAFETY SUPPLIES
200 NSF
Quantity: 1
200 NSF Total



CUSTOMER SERVICE SPACES



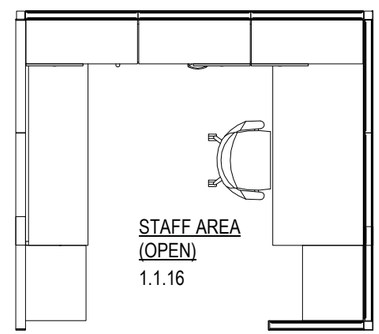
FILES (HD)

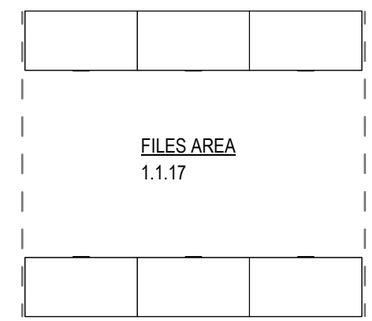
450 NSF
Quantity: 1
450 NSF Total

CUSTOMER SERVICE SPACES

OPEN STAFF AREA
75 NSF
Quantity: 8
600 NSF Total

FILES AREA
75 NSF
Quantity: 1
75 NSF Total





LABORATORY SPACES

Existing laboratory space for KDHE is out of date, and does not provide the flexibility available in contemporary laboratory models. Various models are shown on the following pages to address the needs discussed during the course of this study.

Laboratory space was a major focus of the study in order to meet the needs defined by the State of Kansas and the Department of Health and Environment. Example layouts of laboratory and adjacent spaces are provided for differing department types. The layouts shown represent open laboratory space that can be subdivided to suit various types of users. The open laboratory spaces are immediately adjacent to support space for ease of access to specialty equipment and specialized needs within the laboratory.

MU Health Ambulatory Surgery Unit

SDSU Animal Disease Research and Diagnostic Lab

CSU Translational Medicine Institute

NWU Acklie Hall of Science

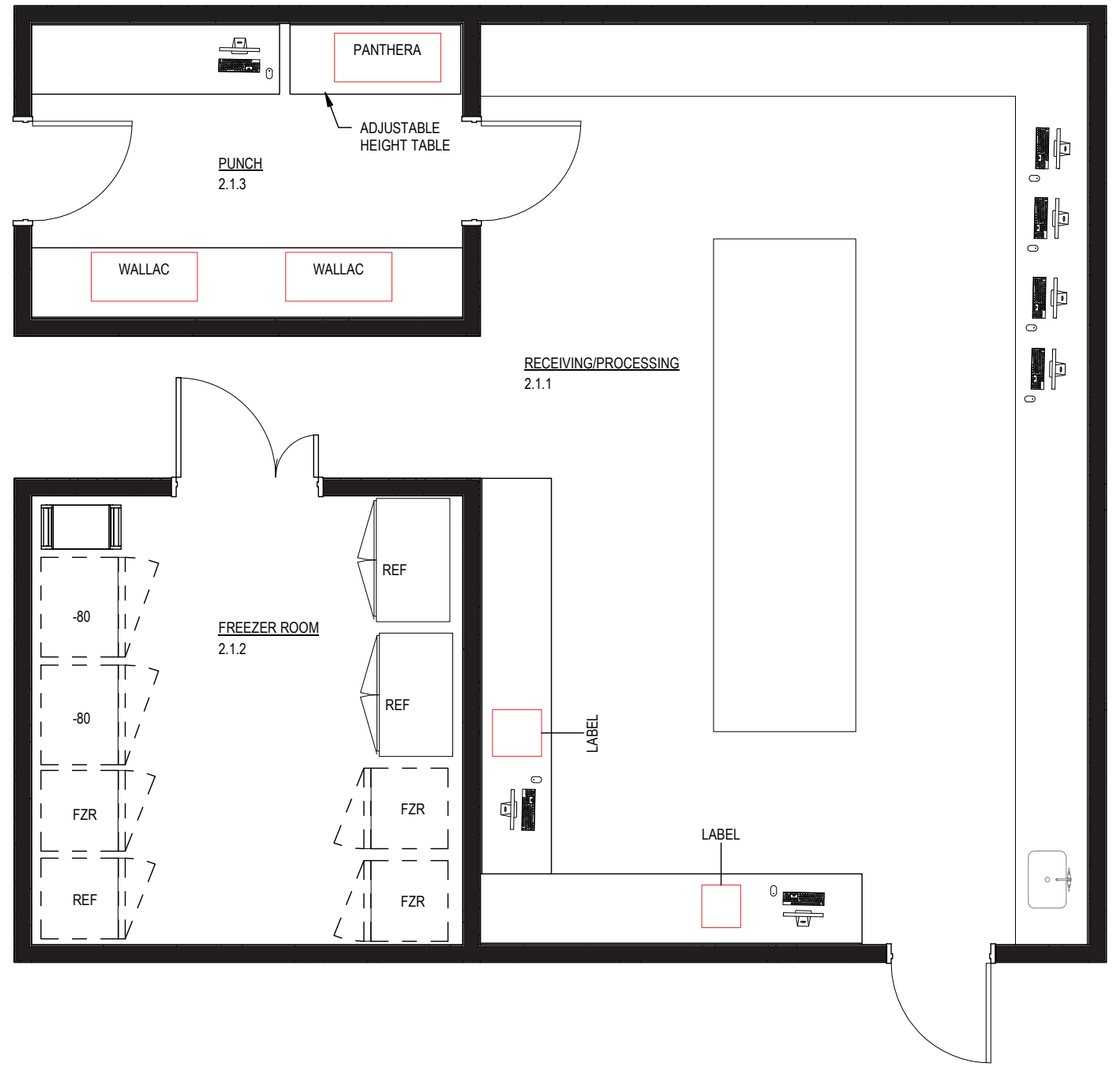
MU International Institute for Nano and Molecular Medicine

HEALTH CHEMISTRY

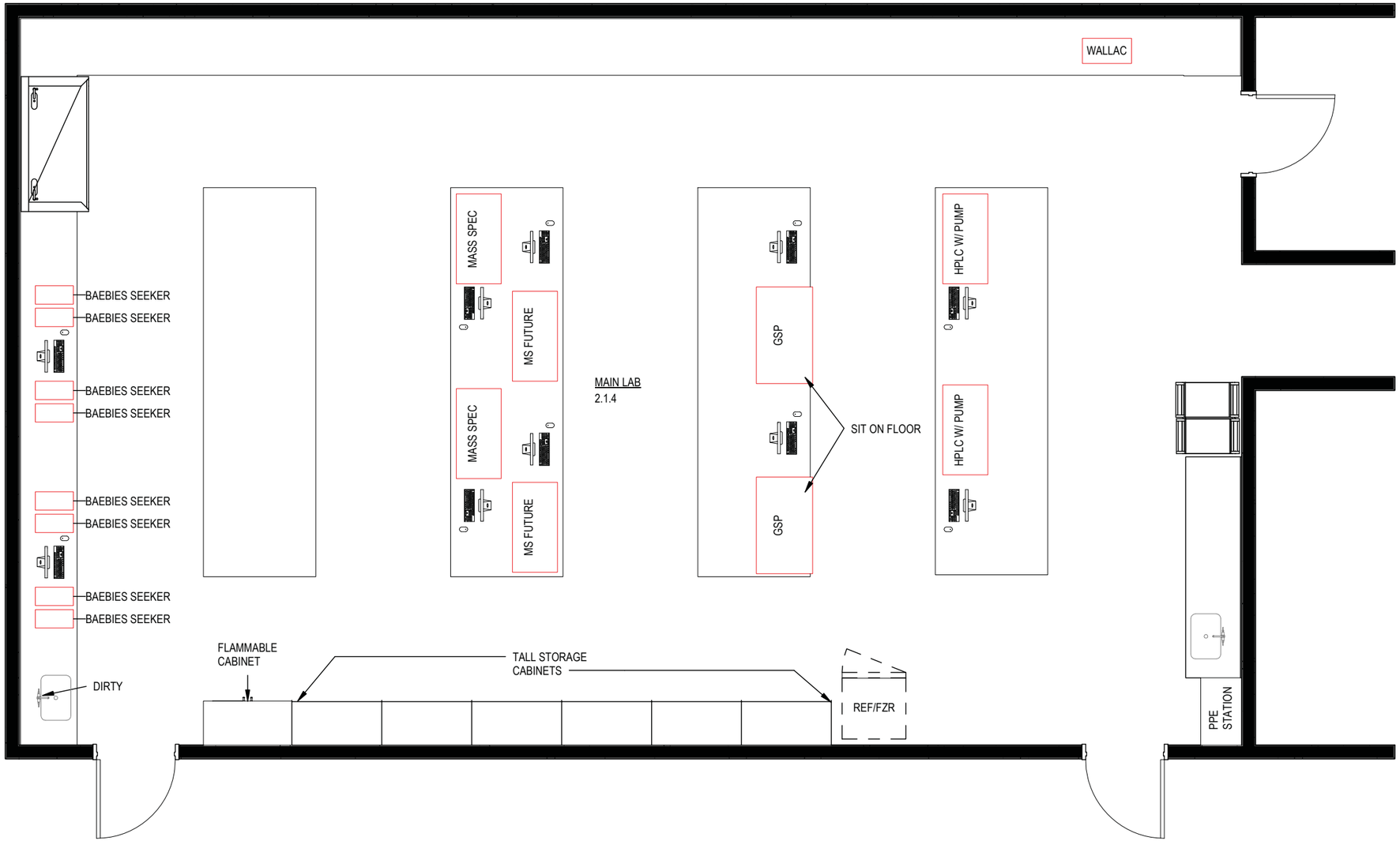
RECEIVING + PROCESSING
363 NSF
Quantity: 2
726 NSF Total

FREEZER ROOM
363 NSF
Quantity: 1
363 NSF Total

PUNCH
363 NSF
Quantity: 0.5
182 NSF Total



HEALTH CHEMISTRY

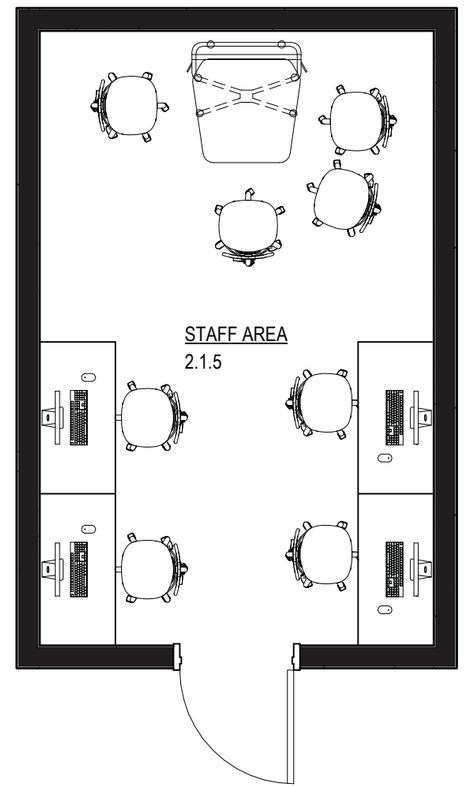


MAIN LAB

363 NSF
Quantity: 5
1,815 NSF Total

HEALTH CHEMISTRY

STAFF AREA
363 NSF
Quantity: 0.5
182 NSF Total



VIROLOGY + SEROLOGY

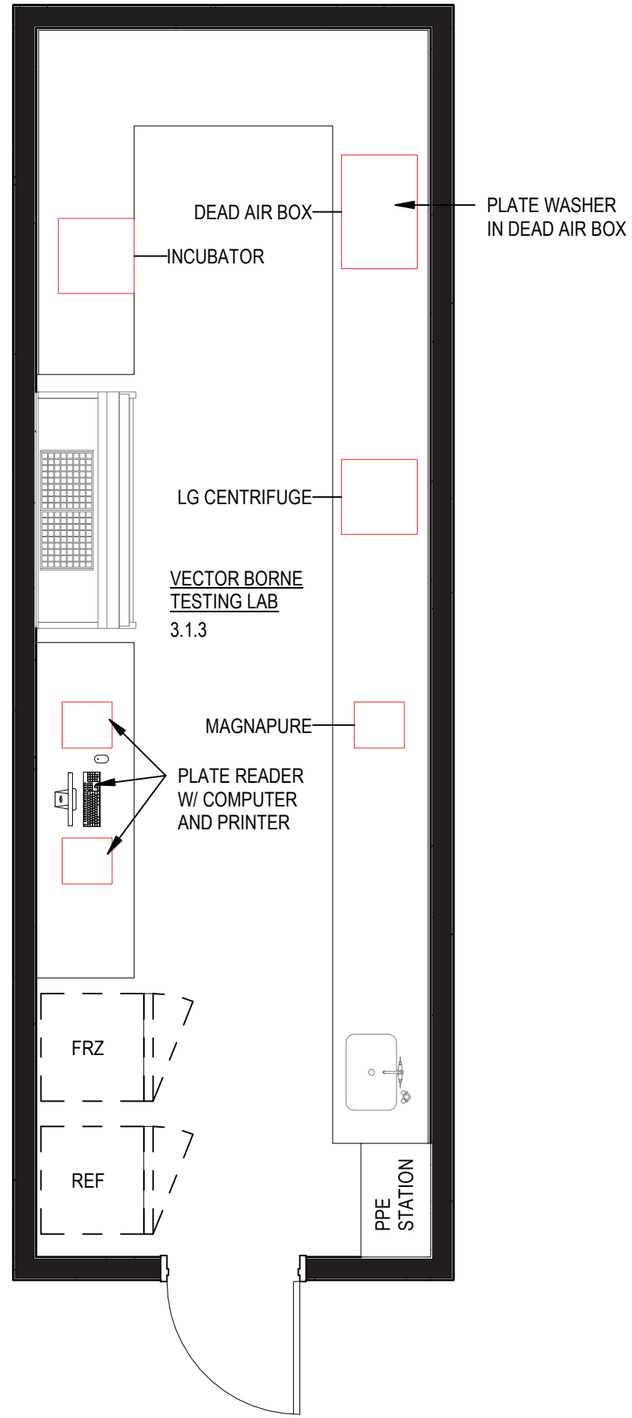
SEROLOGY LAB

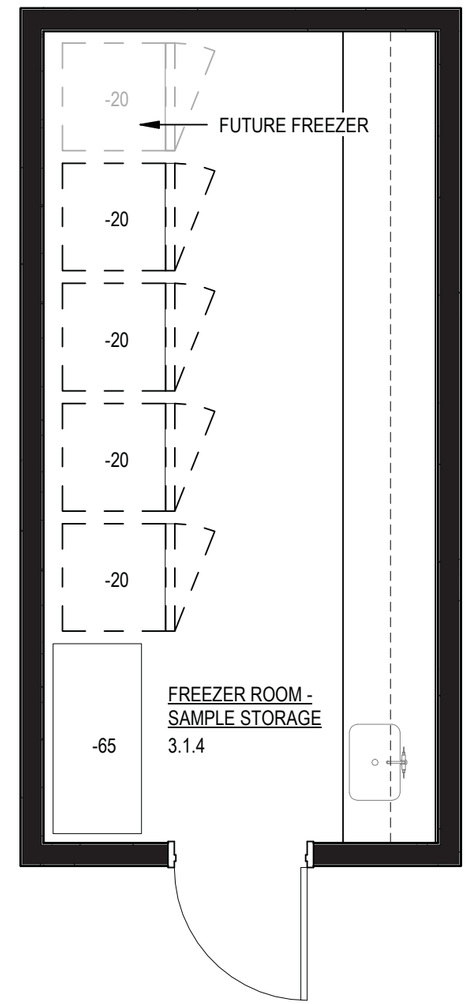
363 NSF
Quantity: 3
1,089 NSF Total

VIROLOGY + SEROLOGY

VECTOR BORNE TESTING LAB
363 NSF
Quantity: 1
363 NSF Total

FREEZER ROOM + SAMPLE STORAGE
363 NSF
Quantity: 1
363 NSF Total

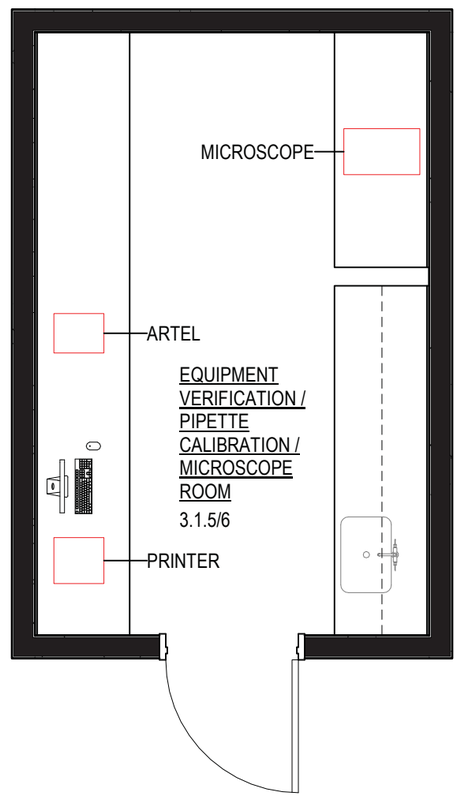




VIROLOGY + SEROLOGY

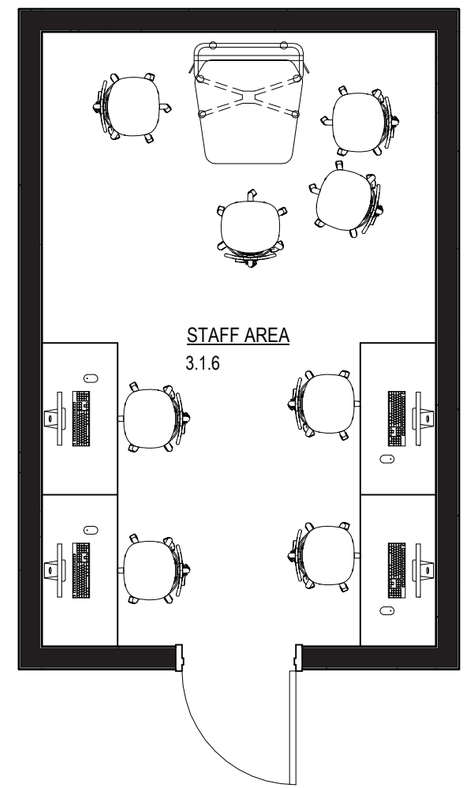
EQUIPMENT VERIFICATION, PIPETTE CALIBRATION + MICROSCOPE ROOM

363 NSF
Quantity: 0.5
182 NSF Total

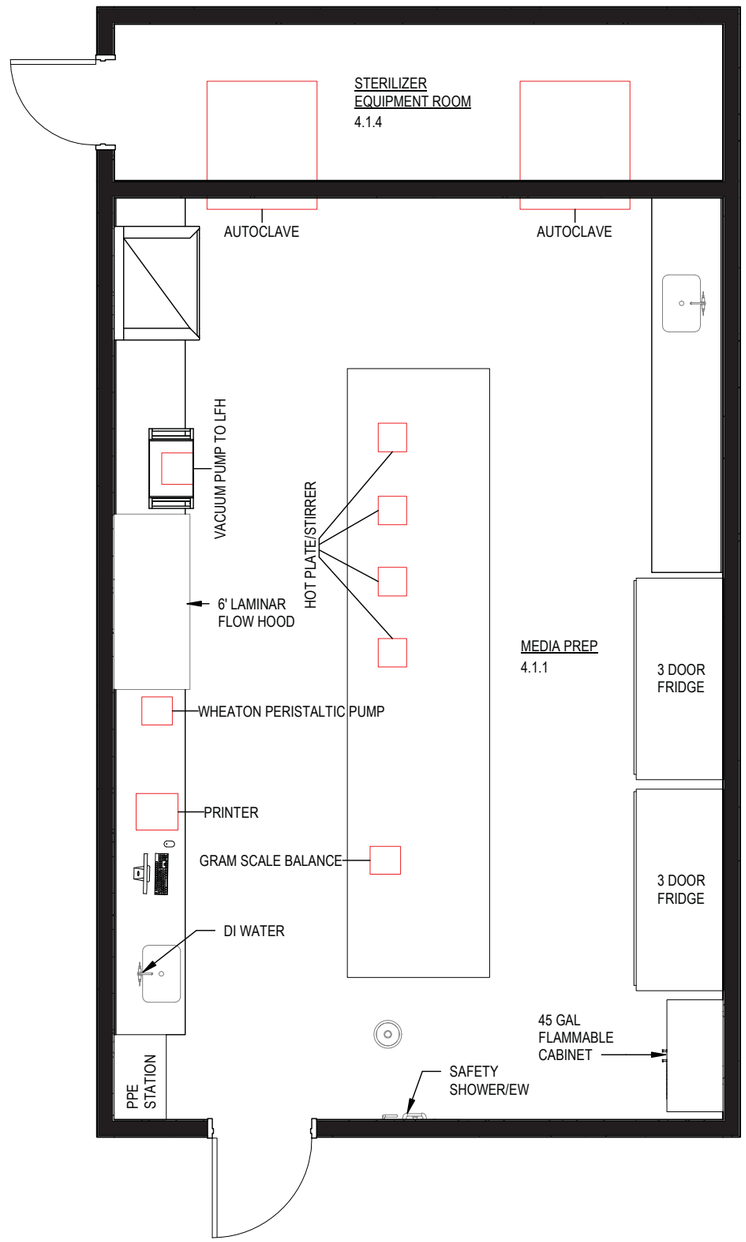


VIROLOGY + SEROLOGY

STAFF AREA
363 NSF
Quantity: 0.5
182 NSF Total



DIAGNOSTIC MICROBIOLOGY



MEDIA PREP
363 NSF
Quantity: 2
726 NSF Total

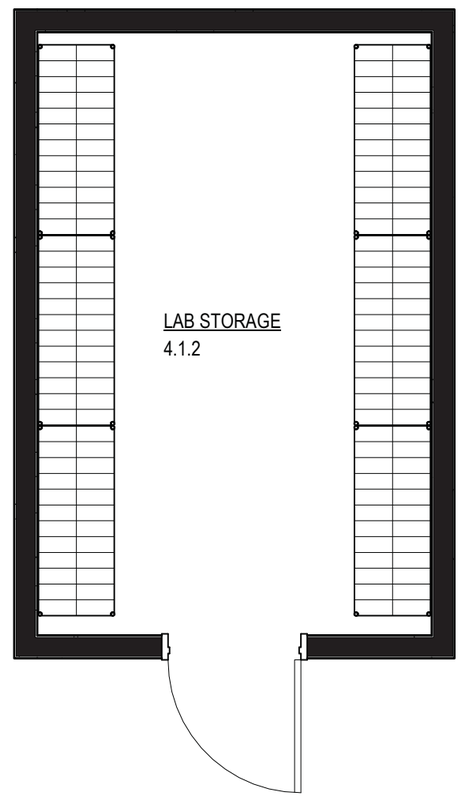
STERILIZER EQUIPMENT ROOM
363 NSF
Quantity: 0.33
120 NSF Total

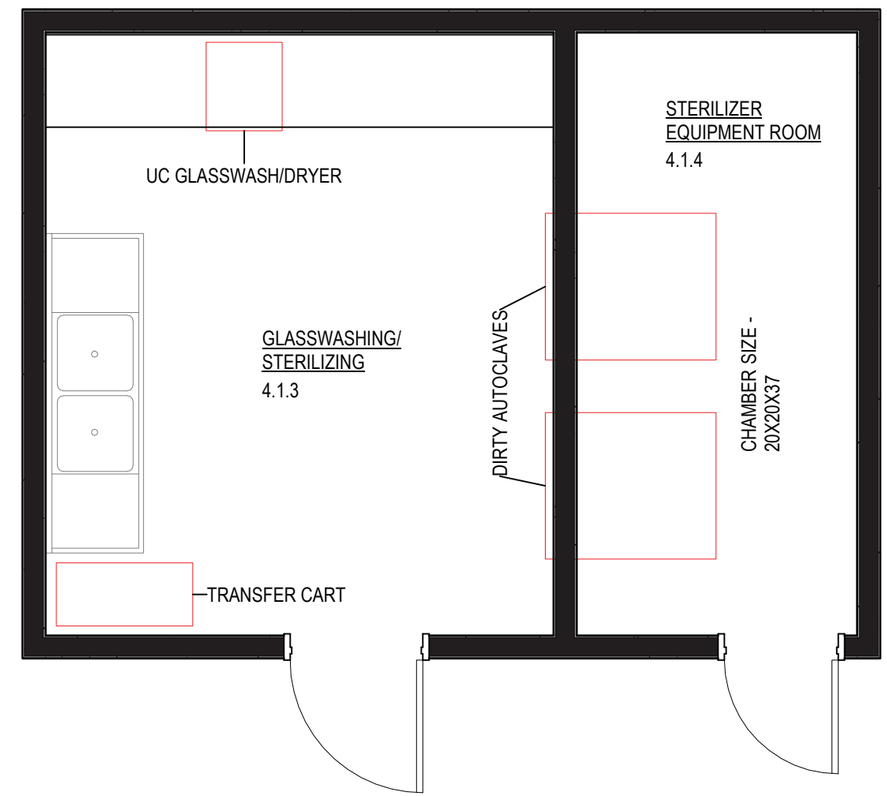
DIAGNOSTIC MICROBIOLOGY

LAB STORAGE
363 NSF
Quantity: 0.5
182 NSF Total

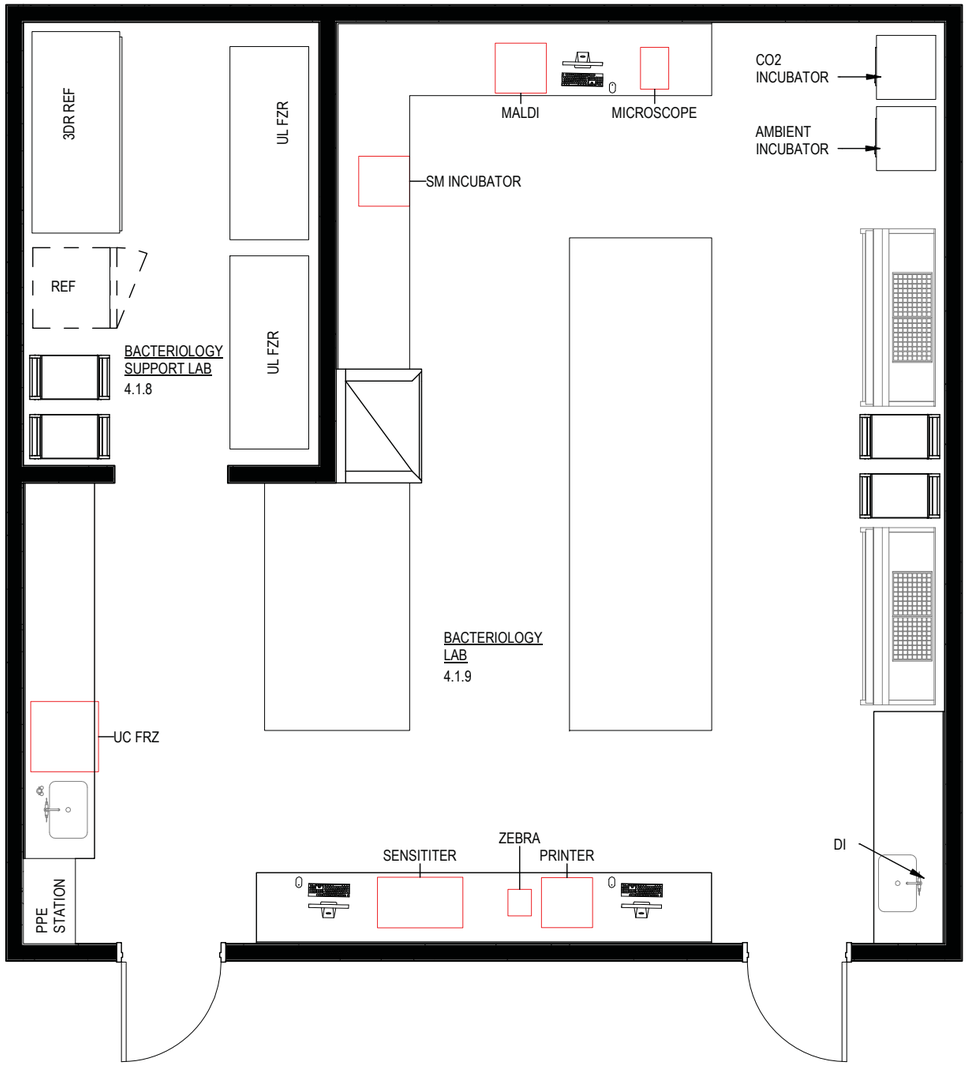
GLASSWASHING + STERILIZING
363 NSF
Quantity: 0.67
243 NSF Total

STERILIZER EQUIPMENT ROOM
363 NSF
Quantity: 0.33
120 NSF Total





DIAGNOSTIC MICROBIOLOGY



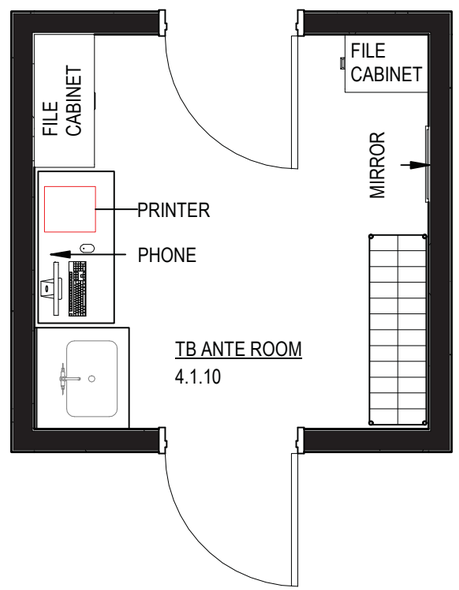
BACTERIOLOGY LAB
363 NSF
Quantity: 2.5
908 NSF Total

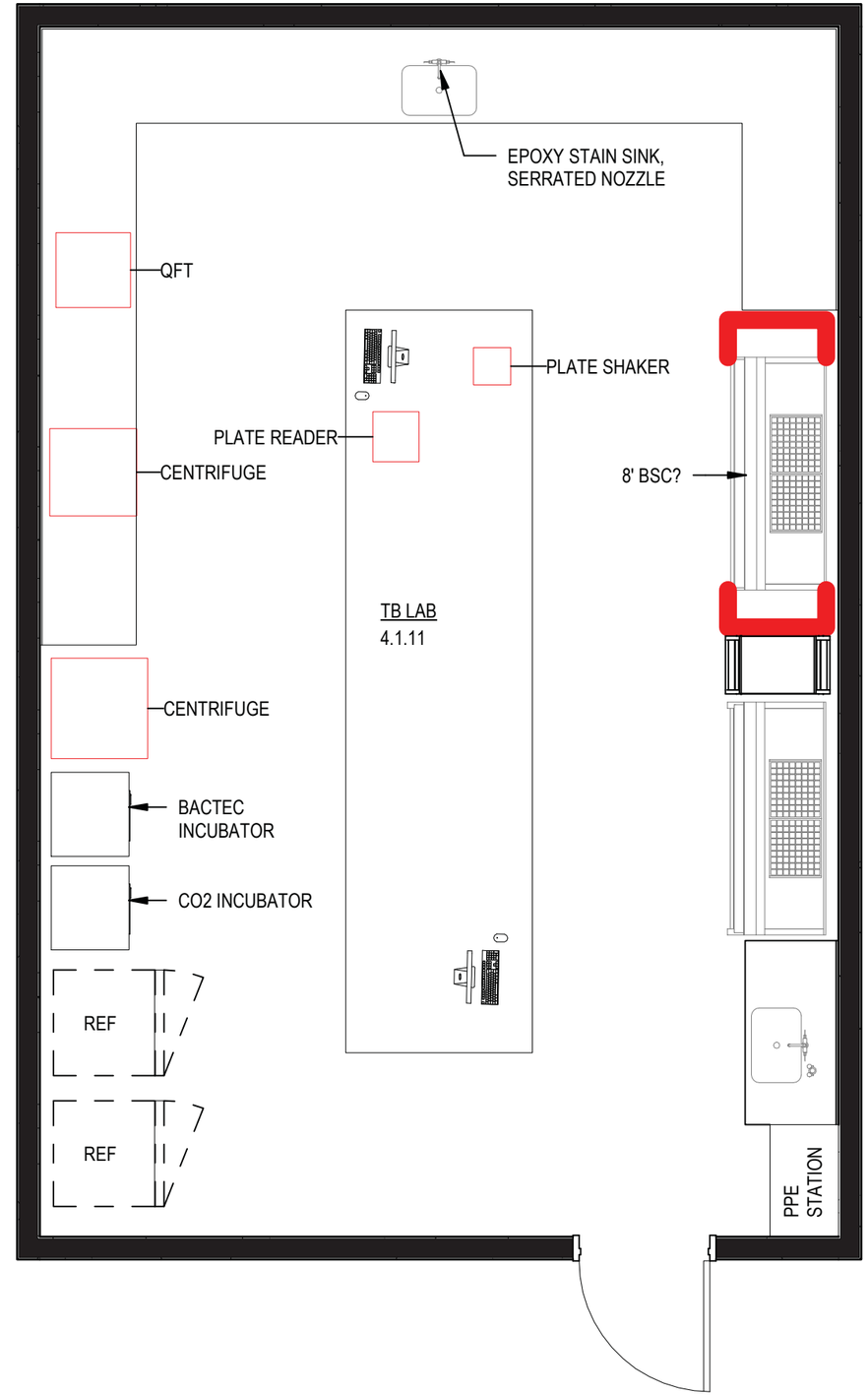
BACTERIOLOGY SUPPORT LAB
363 NSF
Quantity: 1
363 NSF Total

DIAGNOSTIC MICROBIOLOGY

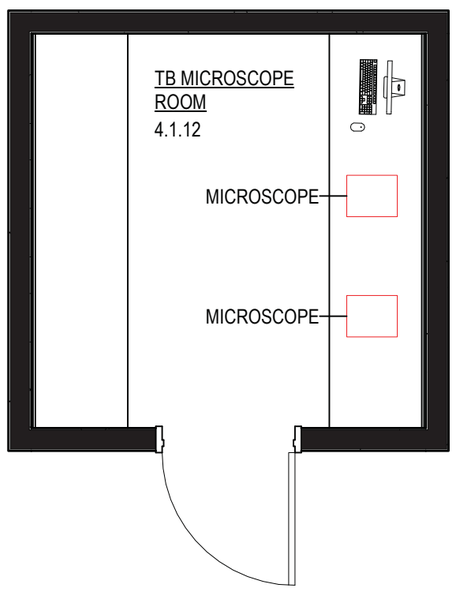
TB ANTE ROOM
363 NSF
Quantity: 0.33
120 NSF Total

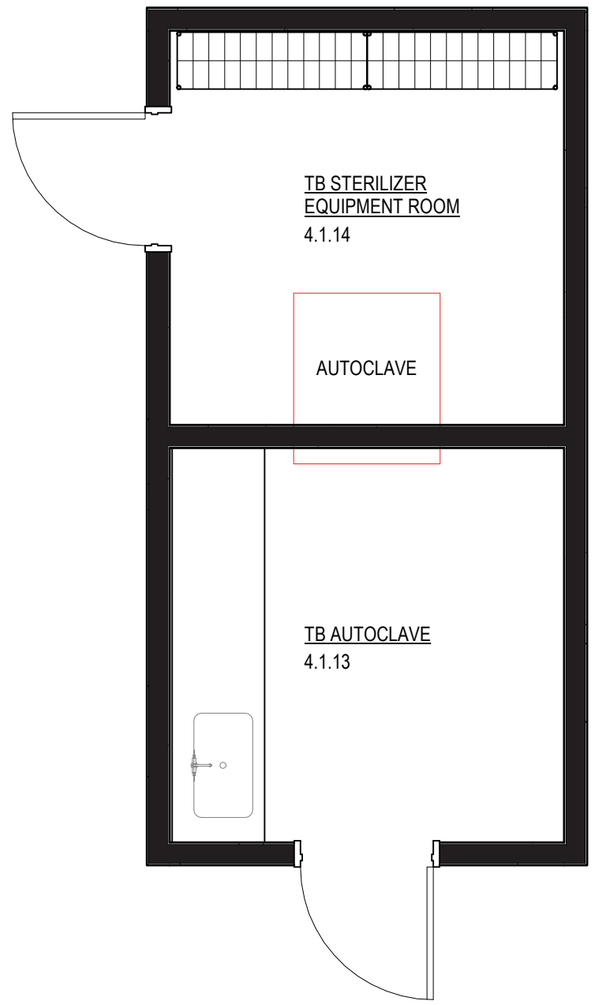
TB LAB
363 NSF
Quantity: 2
726 NSF Total





DIAGNOSTIC MICROBIOLOGY





TB MICROSCOPE ROOM
363 NSF
Quantity: 0.33
120 NSF Total

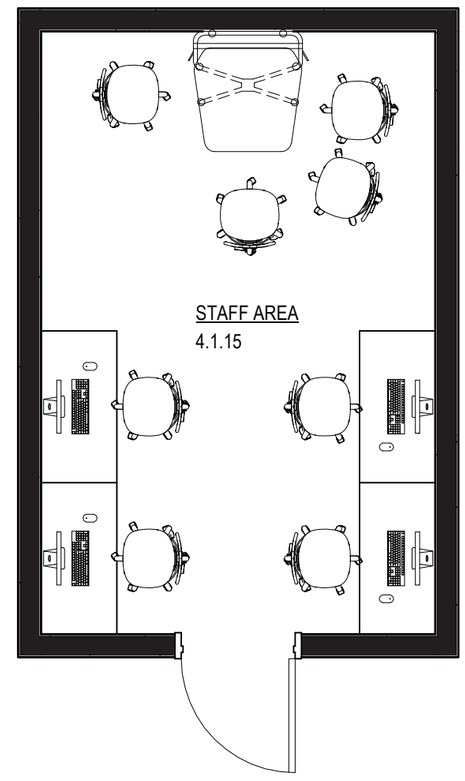
TB AUTOCLAVE
363 NSF
Quantity: 0.33
120 NSF Total

TB STERILIZER EQUIPMENT ROOM
50 NSF
Quantity: 1
50 NSF Total

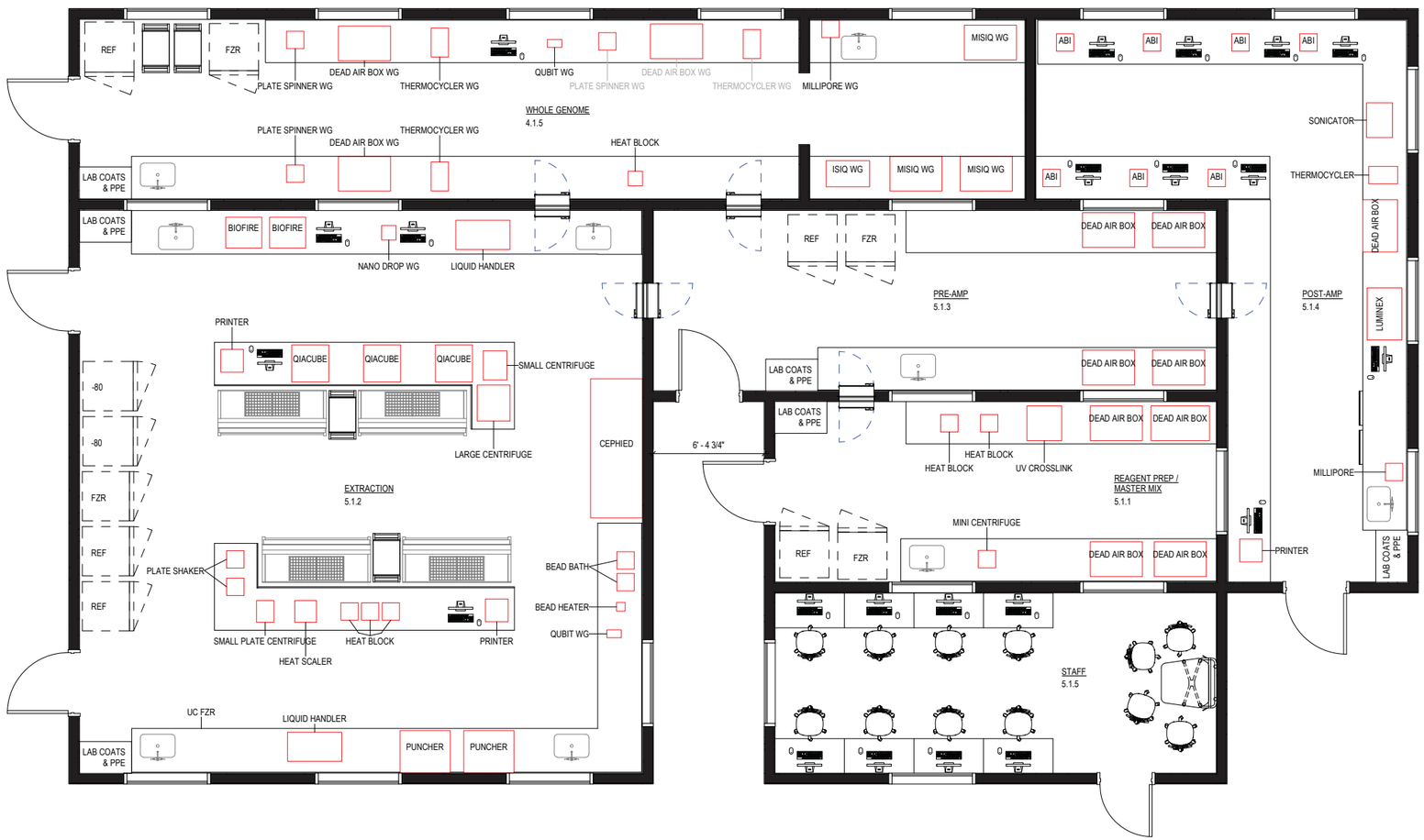
DIAGNOSTIC MICROBIOLOGY

STAFF AREA

363 NSF
Quantity: 0.5
182 NSF Total



MOLECULAR DIAGNOSTICS



WHOLE GENOME
363 NSF
Quantity: 1.67
606 NSF Total

REAGENT PREP + MASTER MIX
363 NSF
Quantity: 0.67
243 NSF Total

EXTRACTION
363 NSF
Quantity: 3
1,089 NSF Total

PRE-AMPLIFICATION
363 NSF
Quantity: 1
363 NSF Total

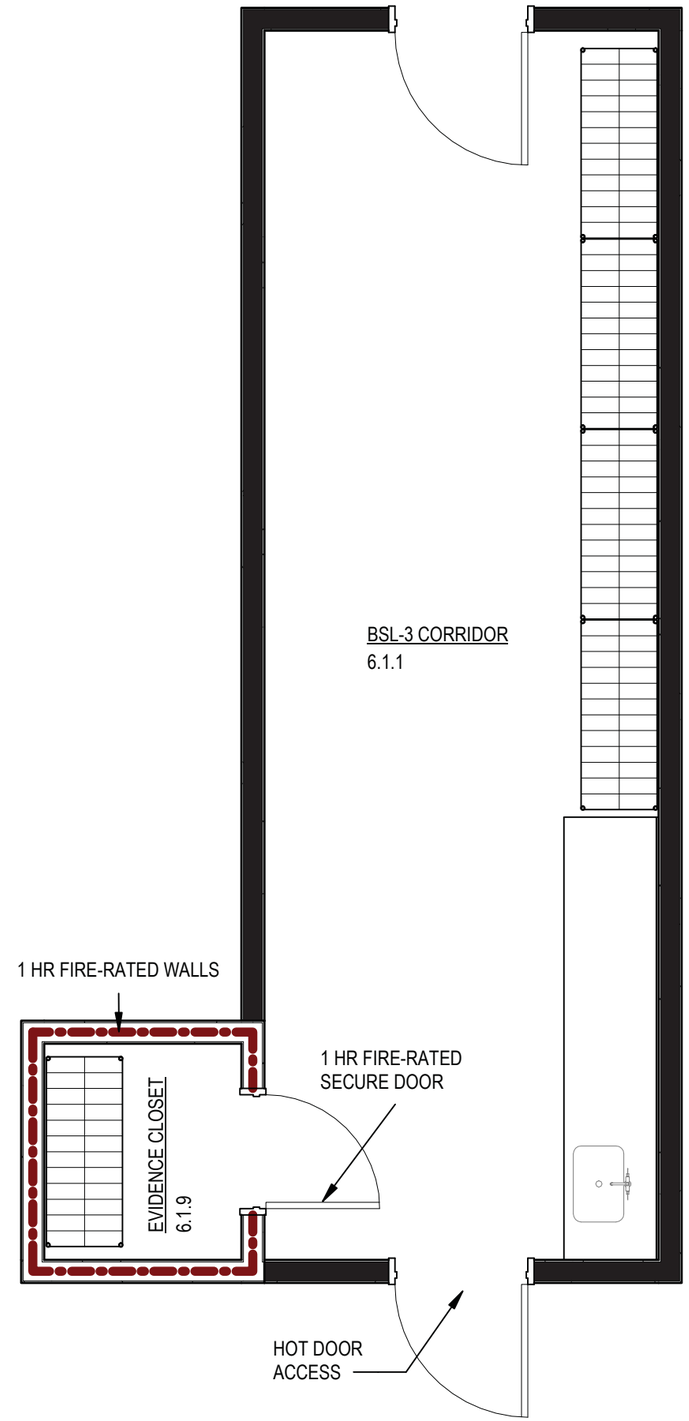
POST-AMPLIFICATION
363 NSF
Quantity: 2
726 NSF Total

STAFF
363 NSF
Quantity: 0.67
243 NSF Total

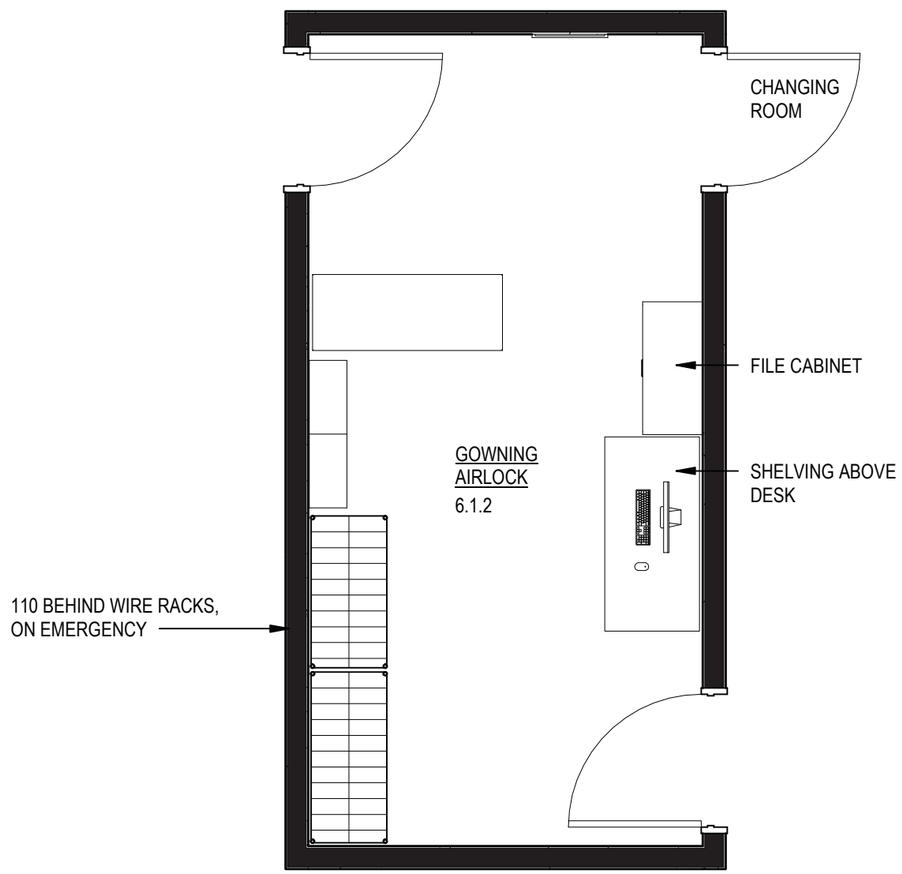
BSL-3

BSL-3 CORRIDOR
363 NSF
Quantity: 1
363 NSF Total

EVIDENCE CLOSET
30 NSF
Quantity: 1
30 NSF Total



BSL-3

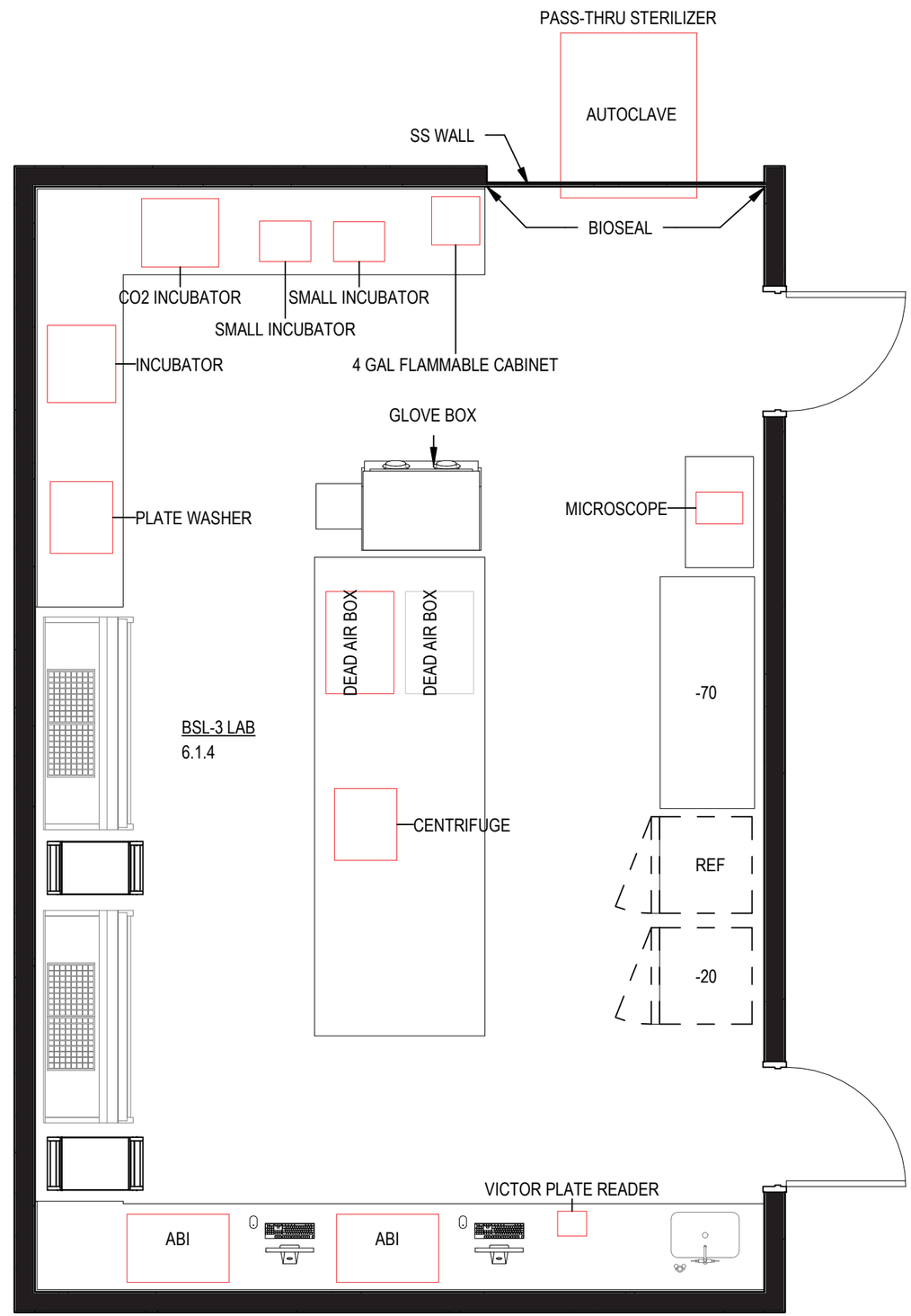


GOWNING AIRLOCK

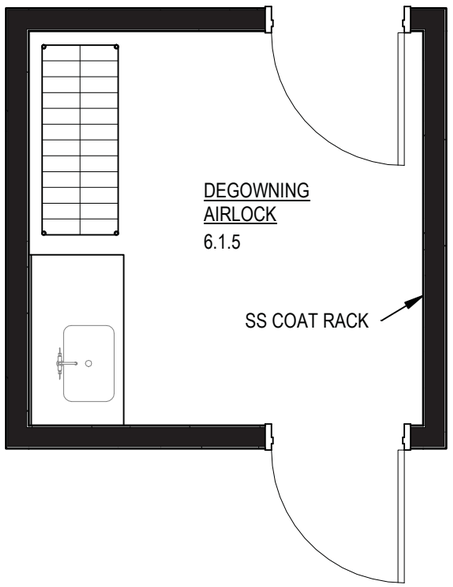
363 NSF
Quantity: 0.67
243 NSF Total

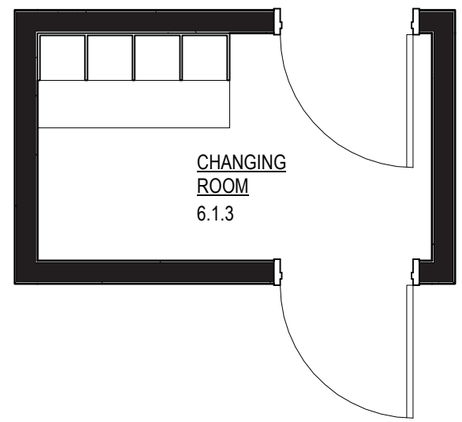
BSL-3

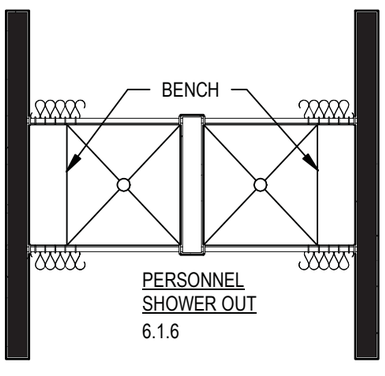
BSL-3 LAB
363 NSF
Quantity: 2
726 NSF Total

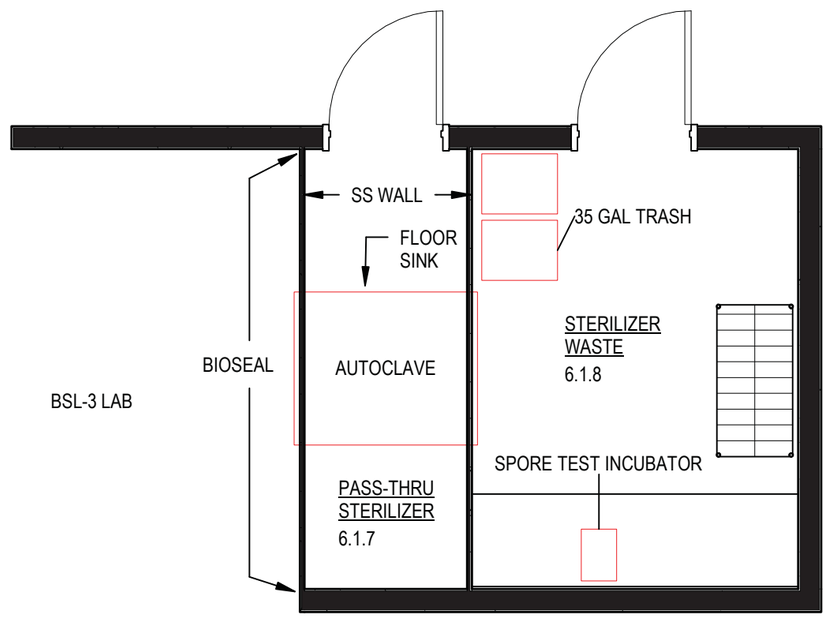


BSL-3









CHANGING ROOM
60 NSF
Quantity: 2
120 NSF Total

DE-GOWNING AIRLOCK
363 NSF
Quantity: 0.33
120 NSF Total

PERSONNEL SHOWER OUT
75 NSF
Quantity: 1
75 NSF Total

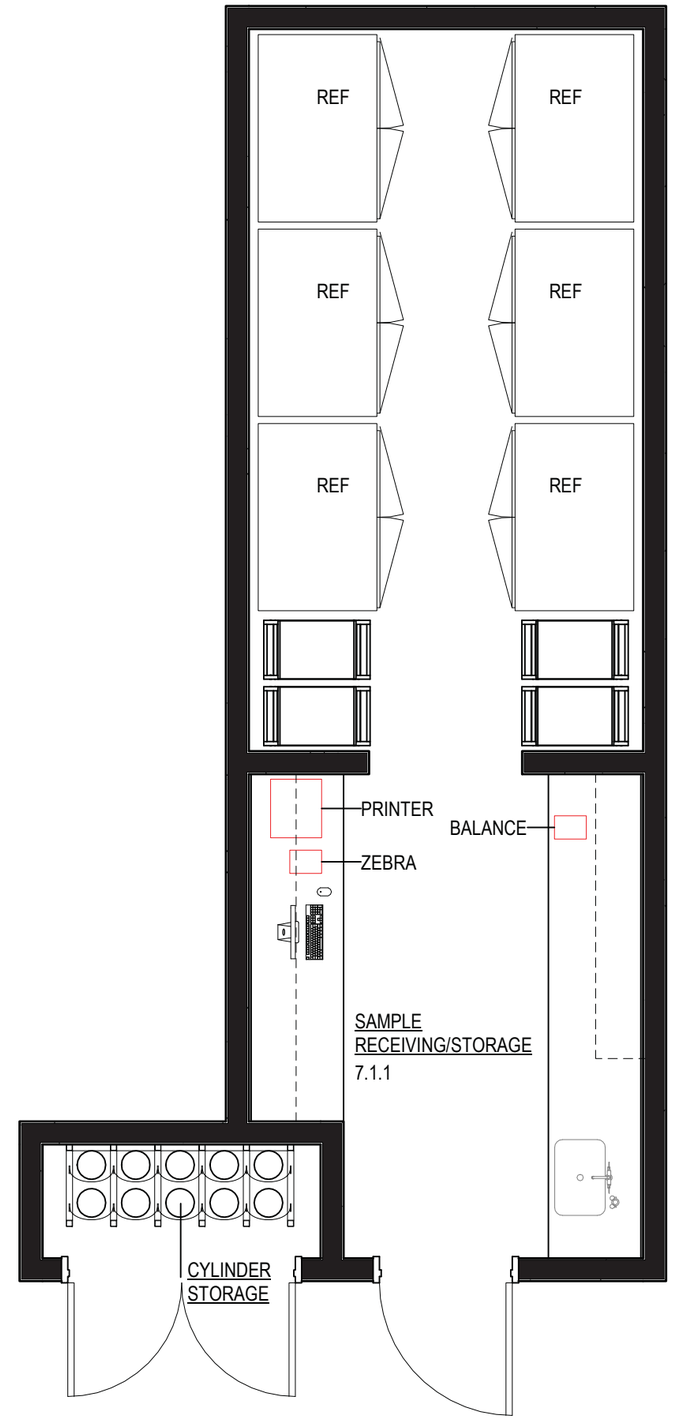
PASS-THRU STERILIZER
50 NSF
Quantity: 1
50 NSF Total

STERILIZER WASTE
100 NSF
Quantity: 1
100 NSF Total

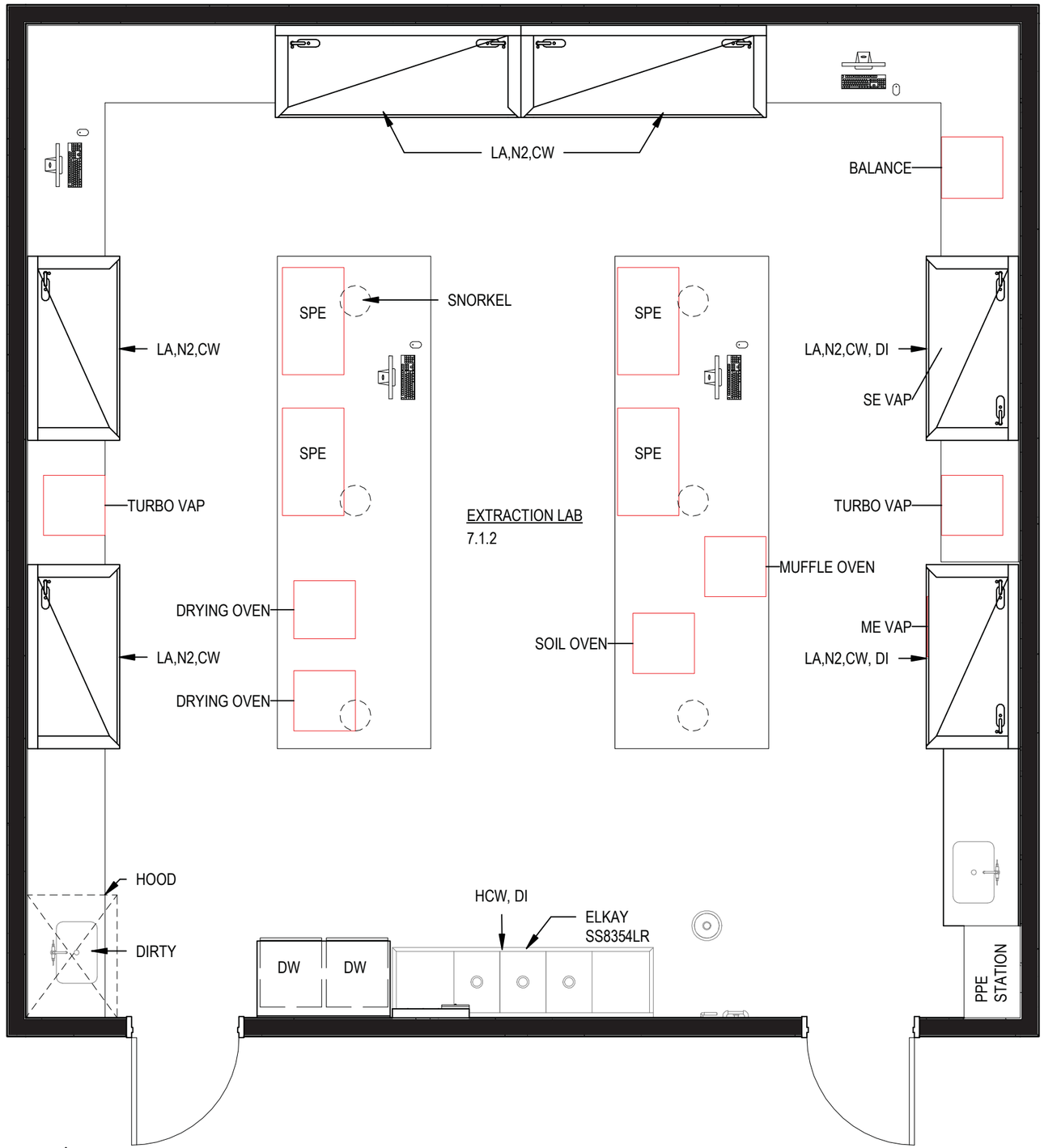
ORGANIC CHEMISTRY

SAMPLE RECEIVING + STORAGE

363 NSF
Quantity: 1
363 NSF Total



ORGANIC CHEMISTRY



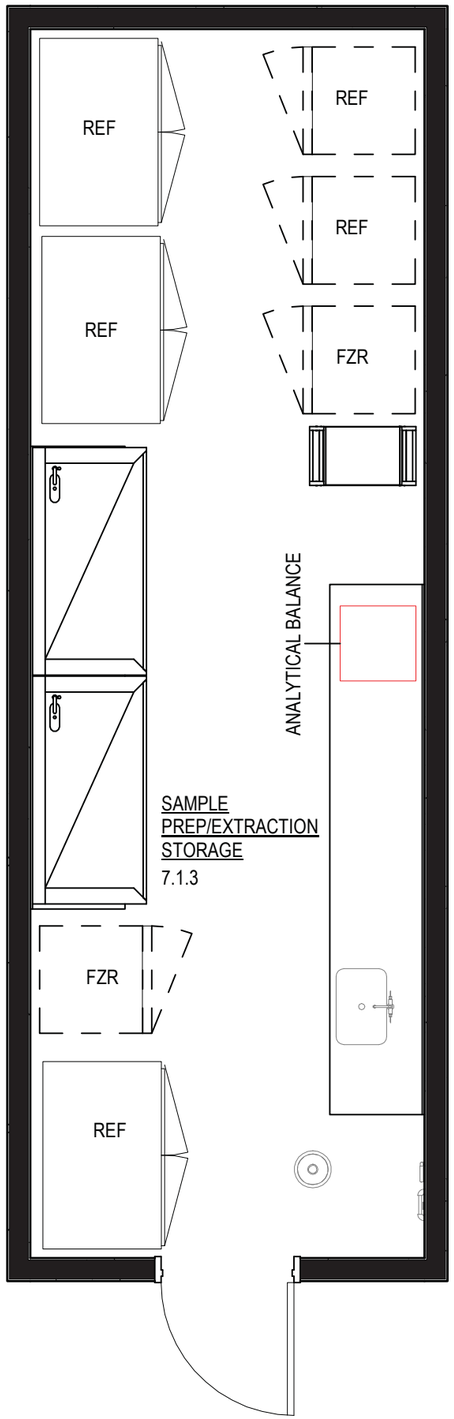
EXTRACTION LAB

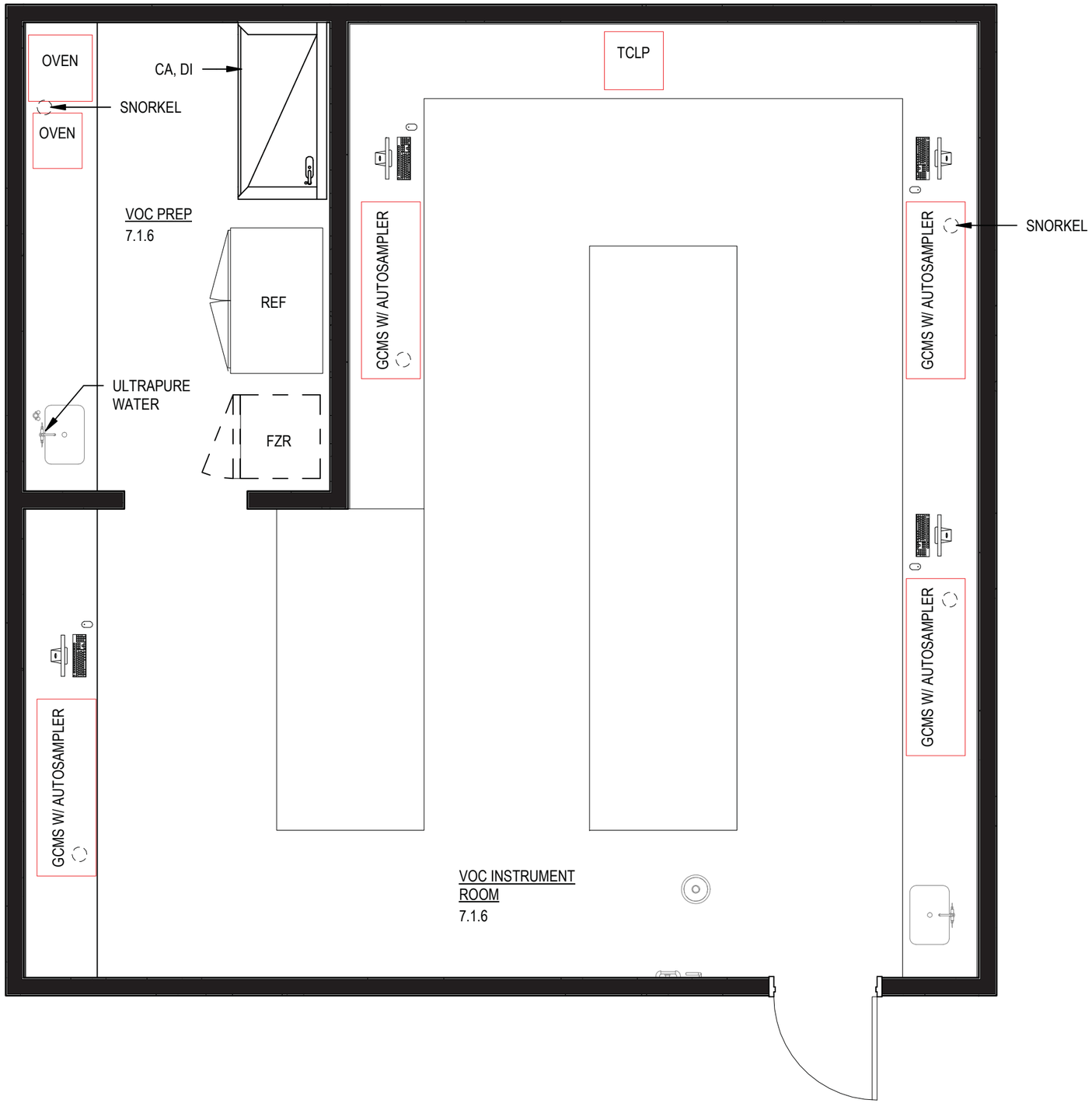
363 NSF
Quantity: 3
1,089 NSF Total

ORGANIC CHEMISTRY

SAMPLE PREP + EXTRACTION STORAGE

363 NSF
Quantity: 1
363 NSF Total





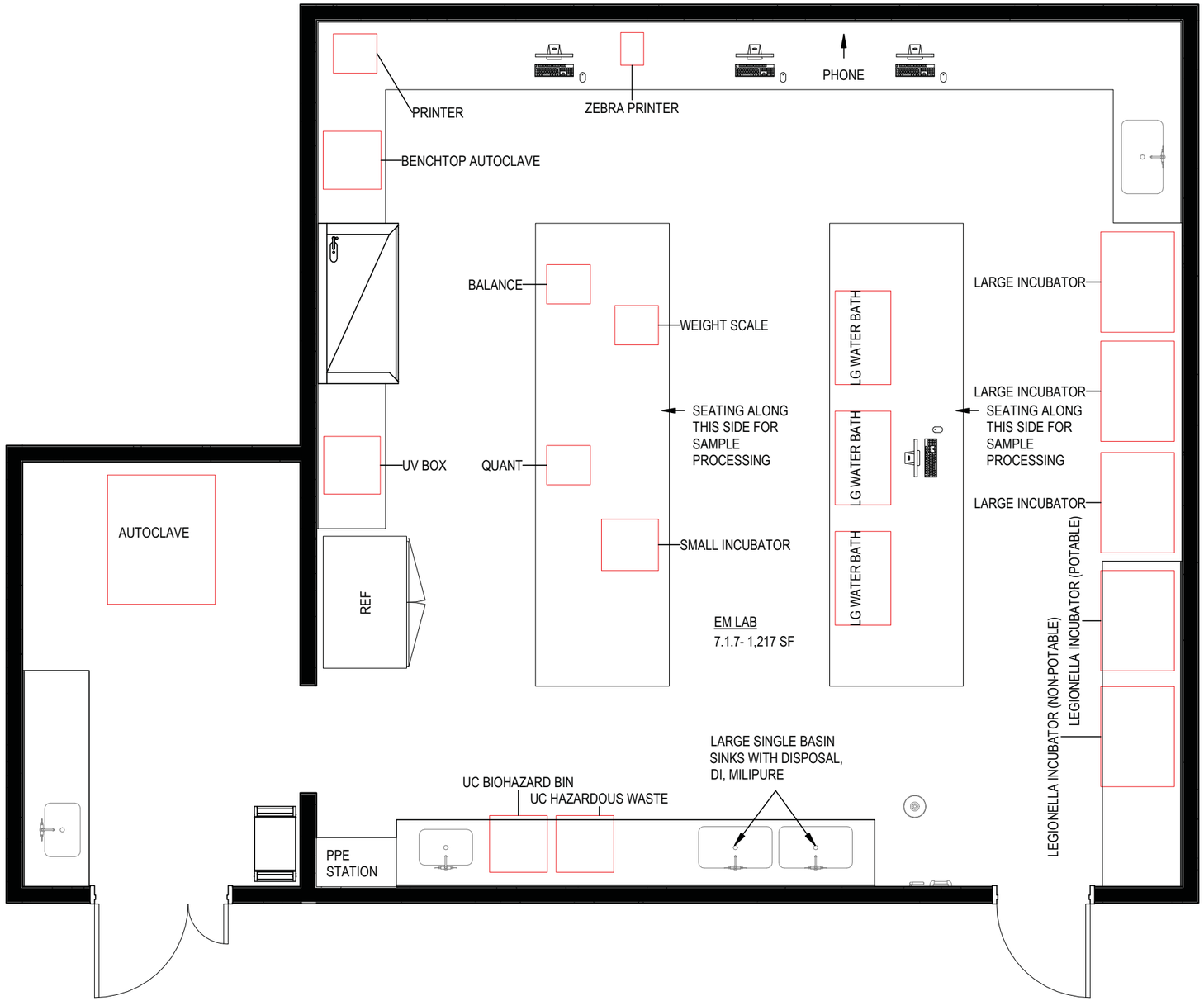
ORGANIC CHEMISTRY

VOC PREP
363 NSF
Quantity: 0.5
182 NSF Total

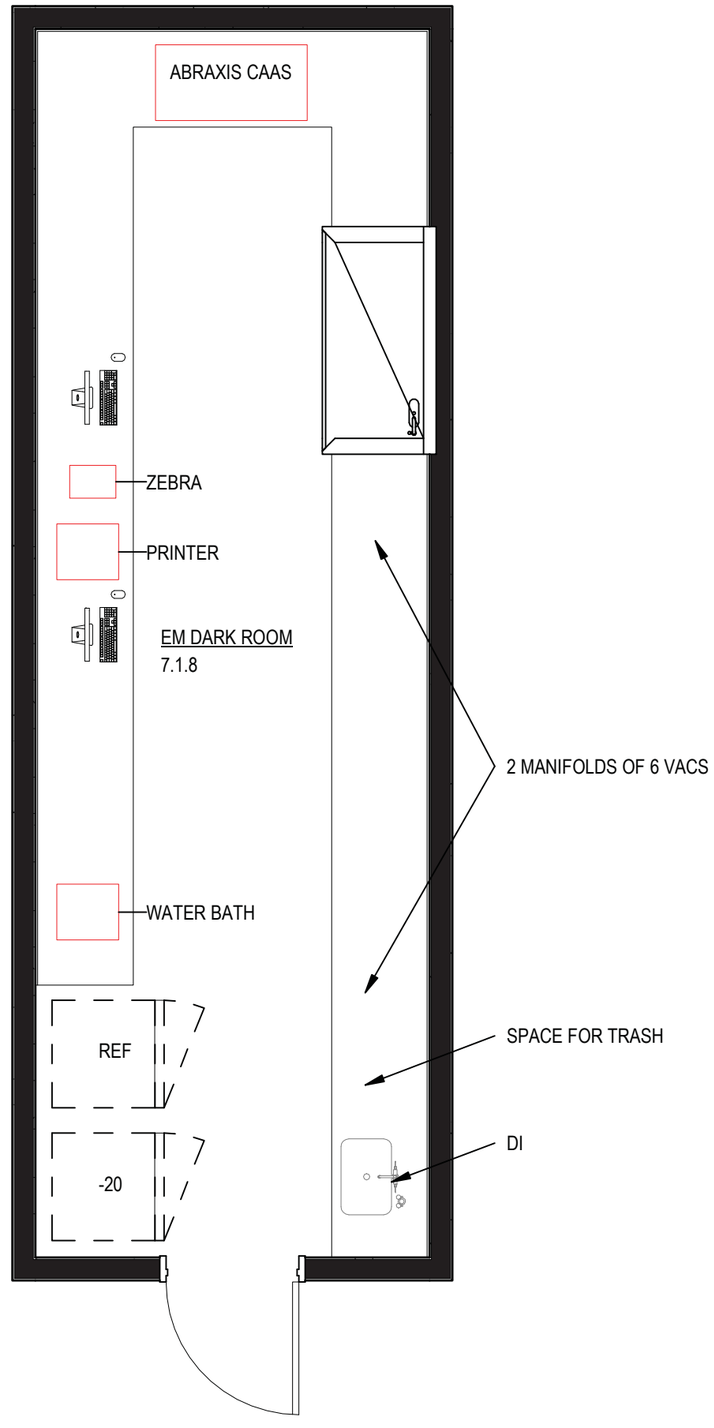
VOC INSTRUMENT ROOM
363 NSF
Quantity: 2.5
908 NSF Total

ORGANIC CHEMISTRY

EM LAB
363 NSF
Quantity: 2.5
908 NSF Total



ORGANIC CHEMISTRY

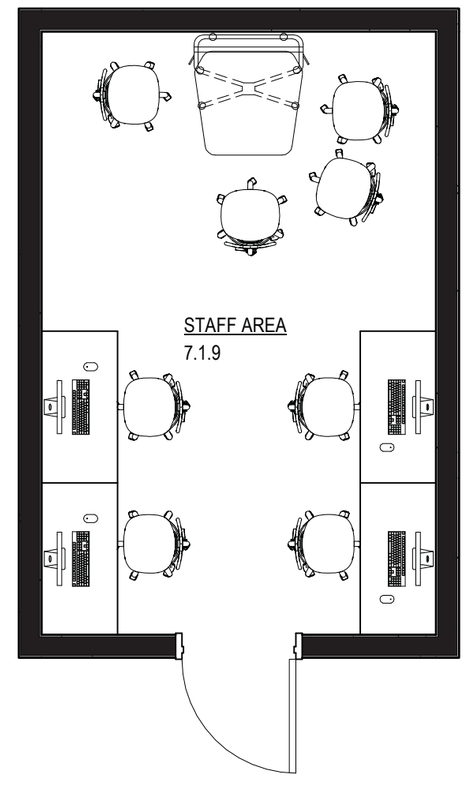


EM DARK ROOM

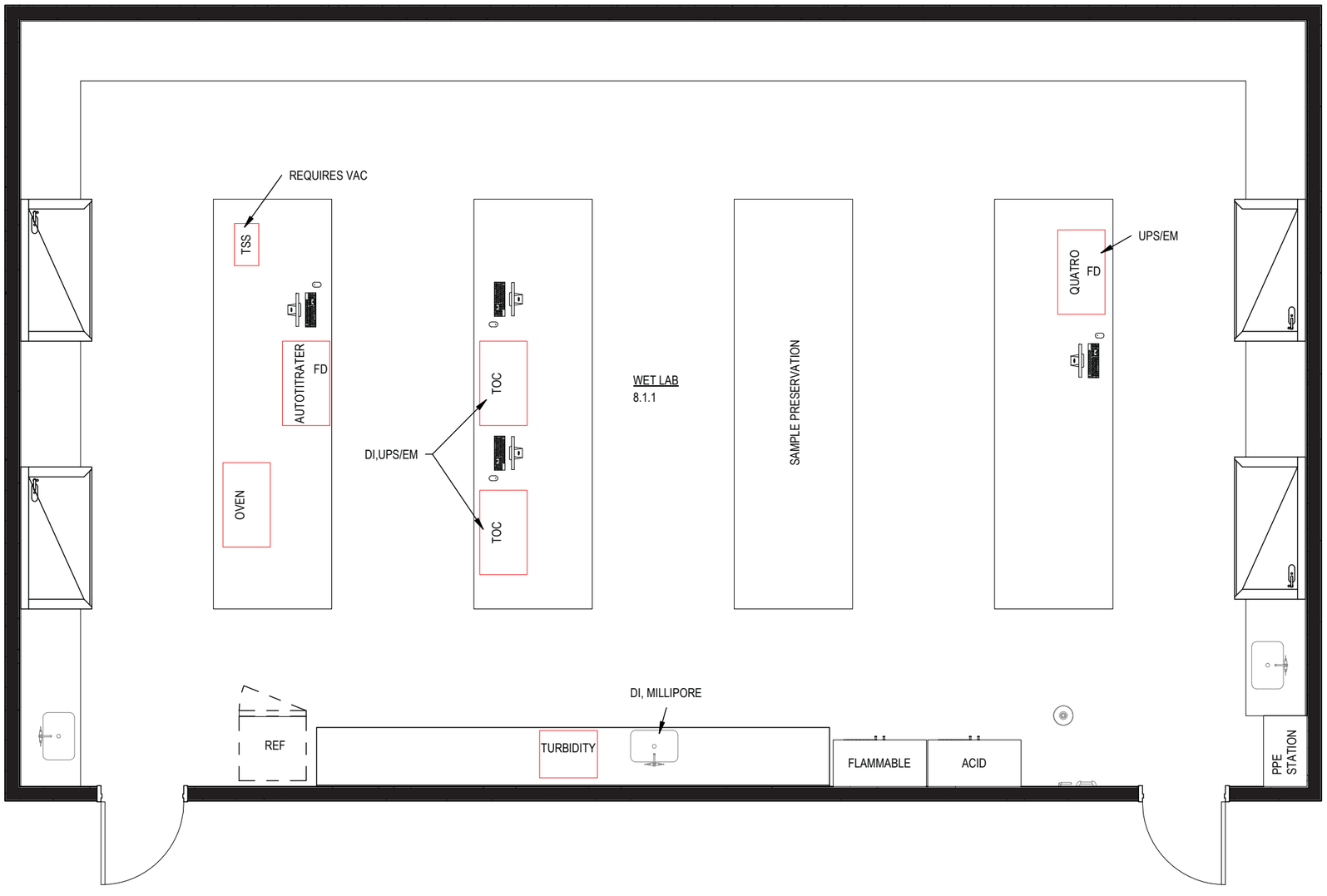
363 NSF
Quantity: 1
363 NSF Total

ORGANIC CHEMISTRY

STAFF AREA
363 NSF
Quantity: 0.5
182 NSF Total



INORGANIC CHEMISTRY



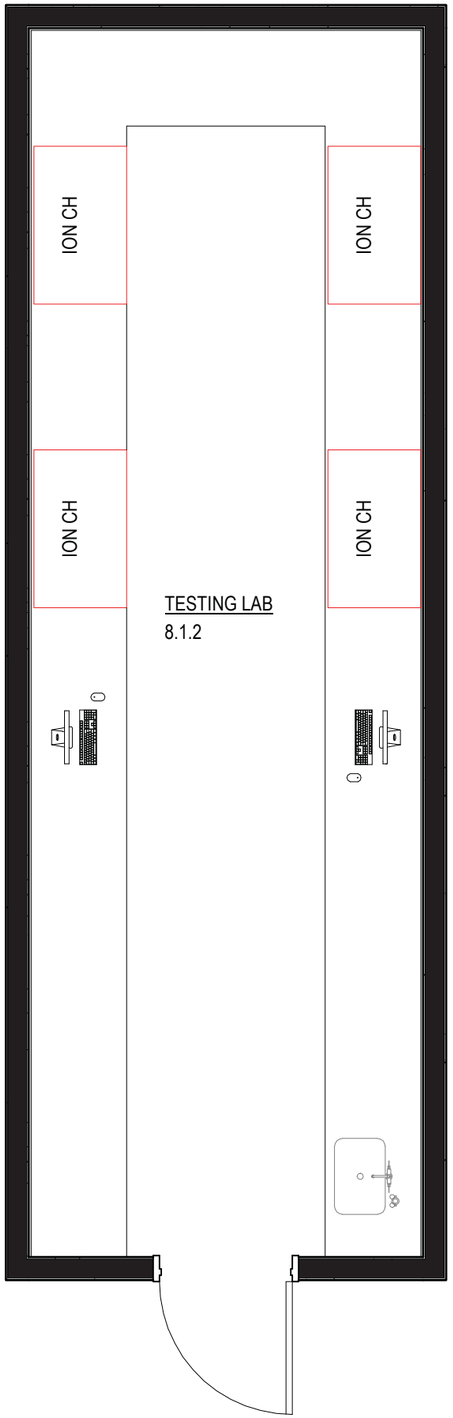
WET LAB

363 NSF
Quantity: 5
1,815 NSF Total

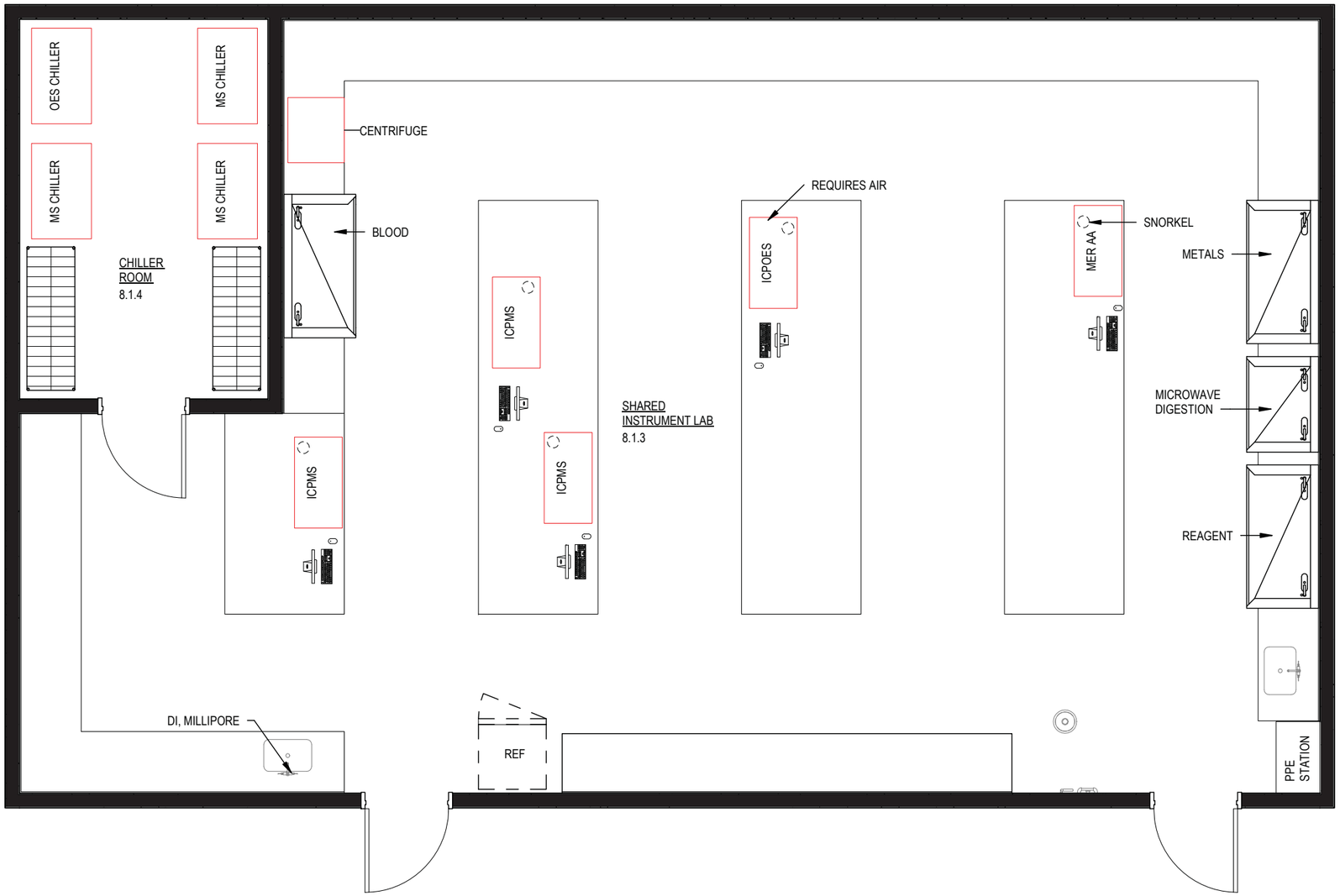
INORGANIC CHEMISTRY

TESTING LAB

363 NSF
Quantity: 1
363 NSF Total



INORGANIC CHEMISTRY



SHARED INSTRUMENT LAB

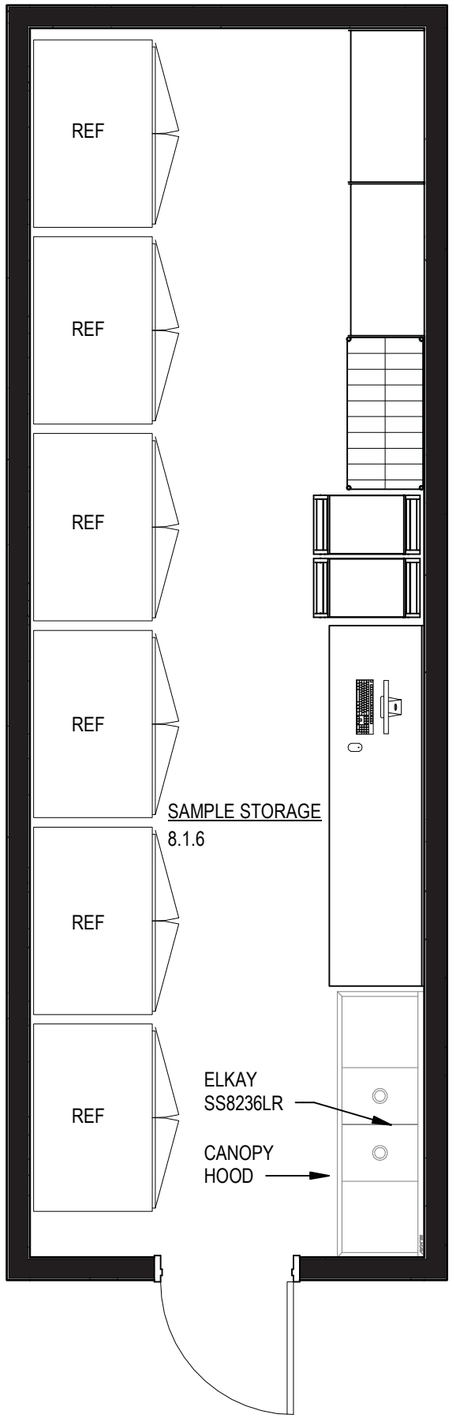
363 NSF
Quantity: 4.5
1,634 NSF Total

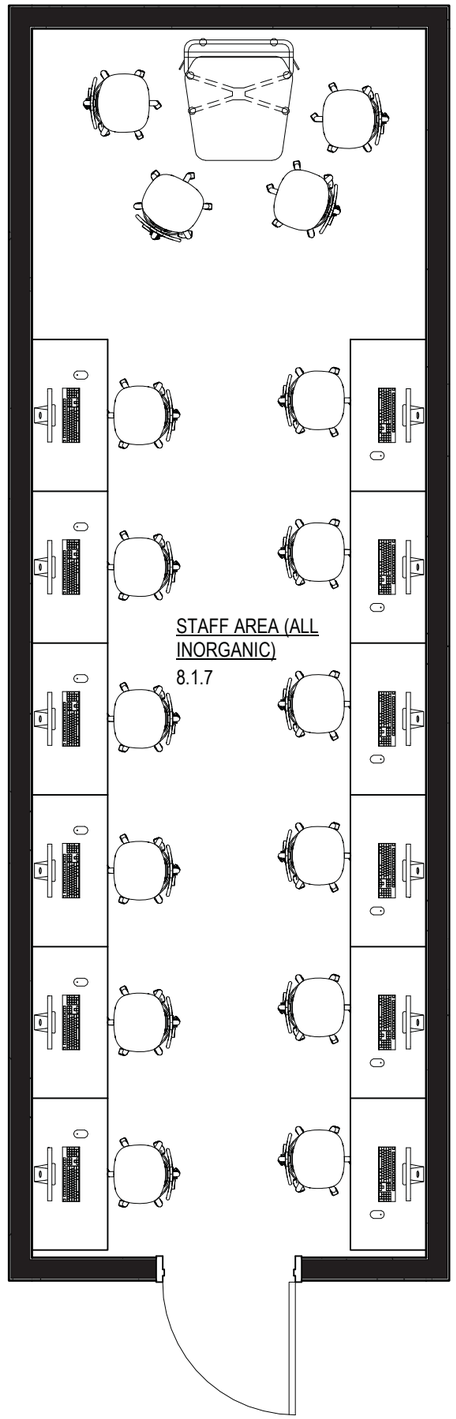
CHILLER ROOM

363 NSF
Quantity: 0.5
182 NSF Total

INORGANIC CHEMISTRY

SAMPLE STORAGE
363 NSF
Quantity: 1
363 NSF Total





INORGANIC CHEMISTRY

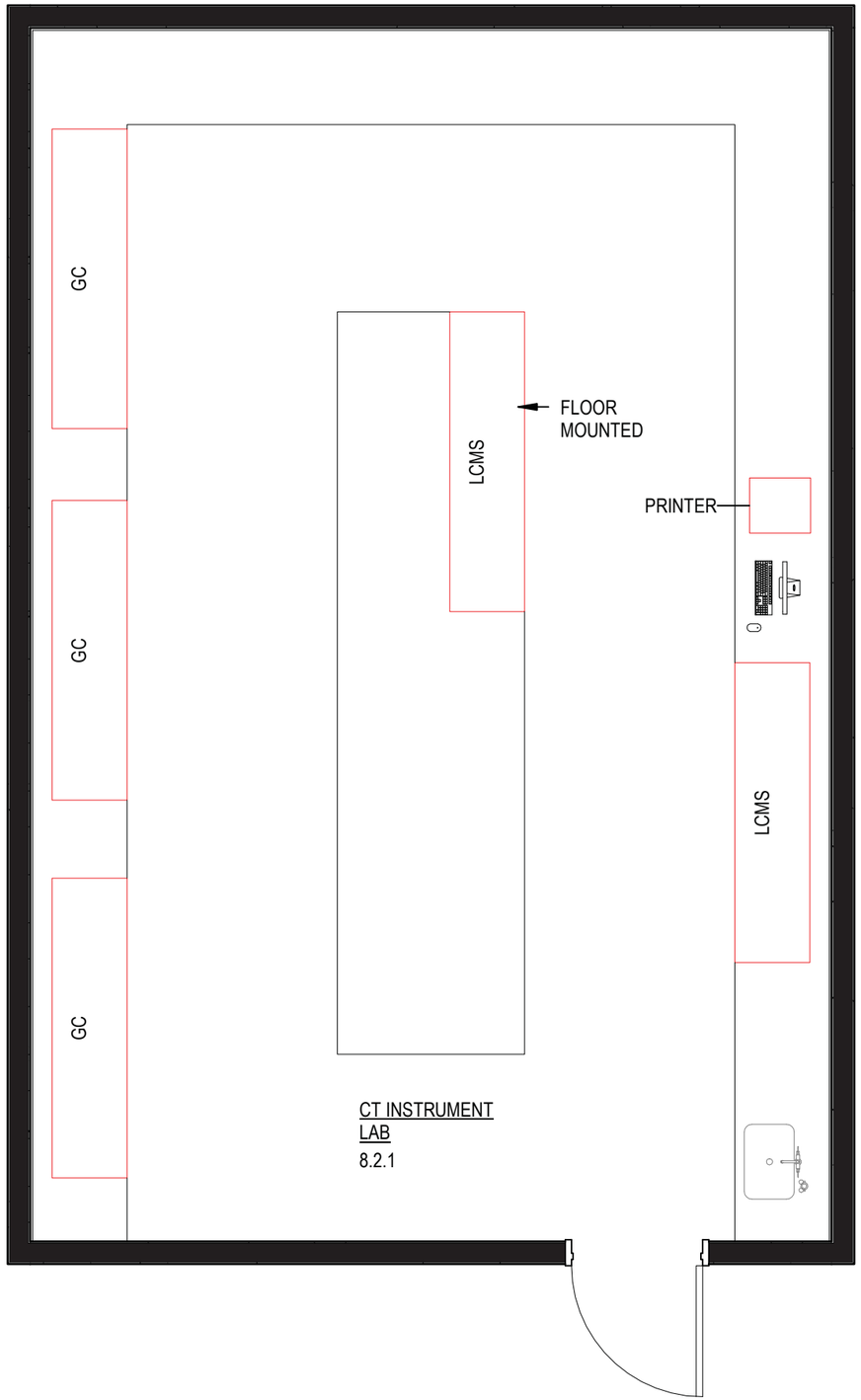
STAFF AREA

363 NSF
Quantity: 1
363 NSF Total

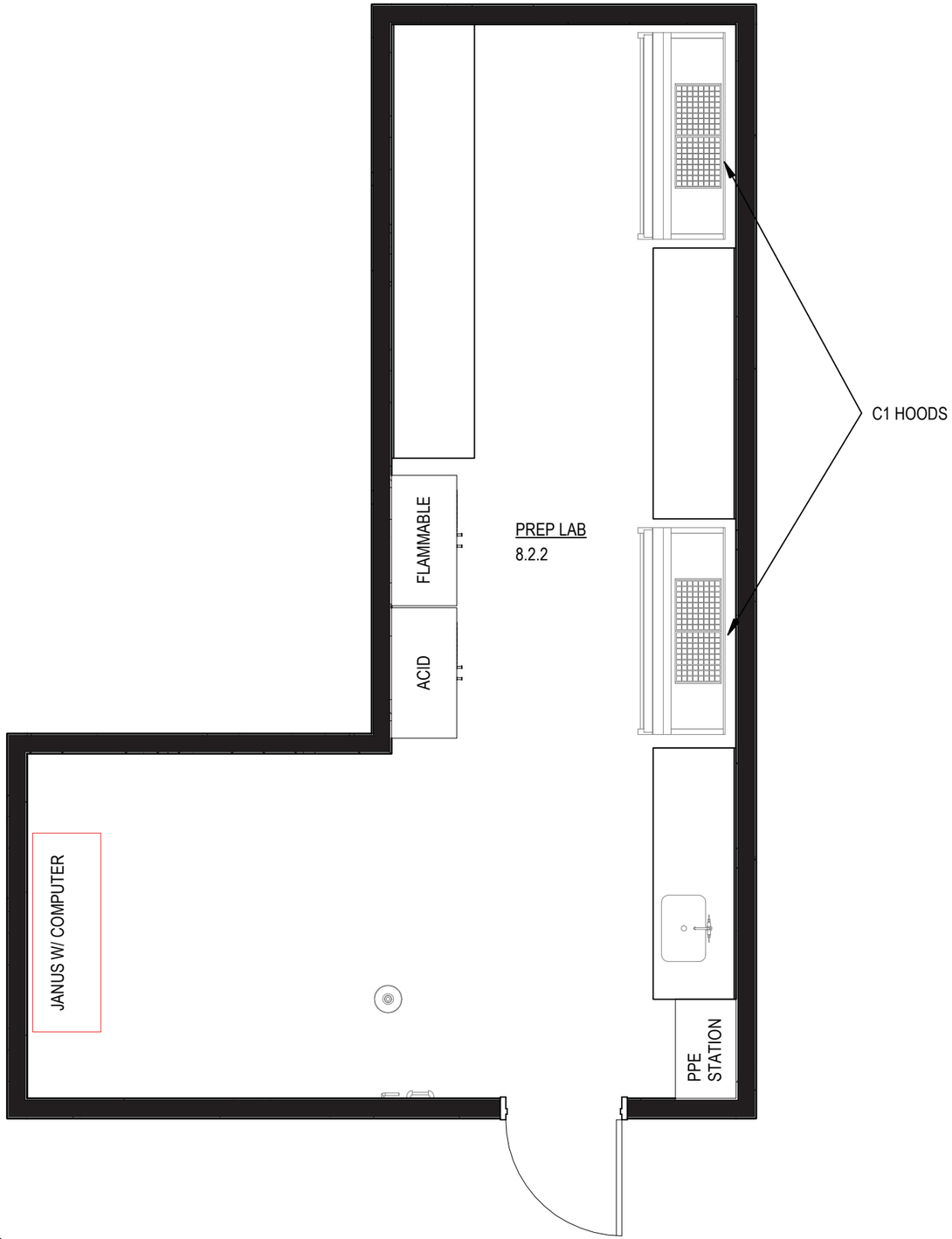
CHEMICAL TERRORISM

CT INSTRUMENT LAB

363 NSF
Quantity: 2
726 NSF Total



CHEMICAL TERRORISM



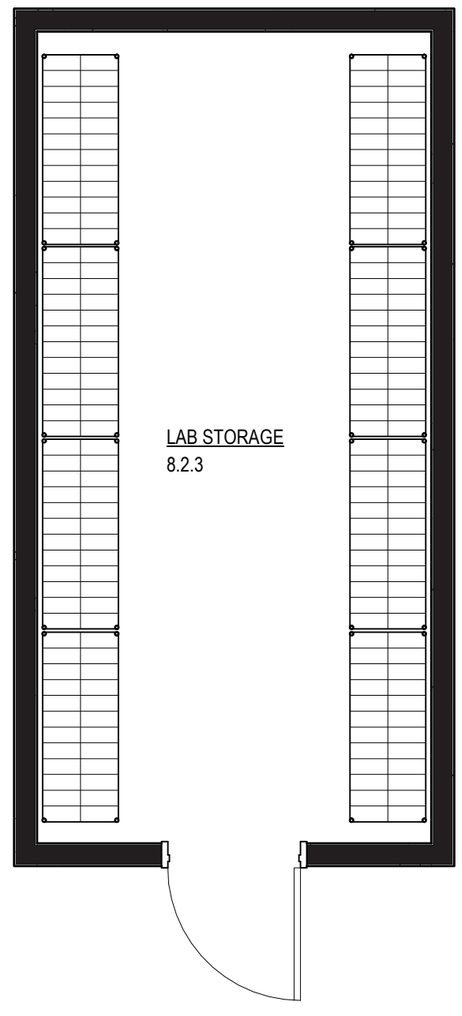
PREP LAB

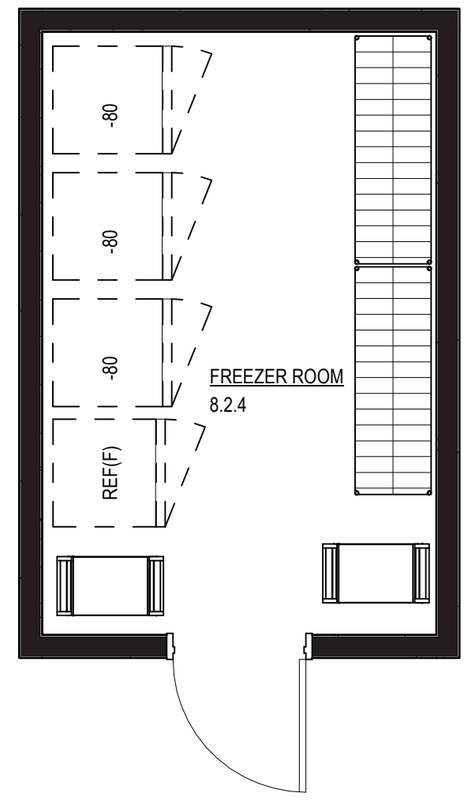
363 NSF
Quantity: 1.33
483 NSF Total

CHEMICAL TERRORISM

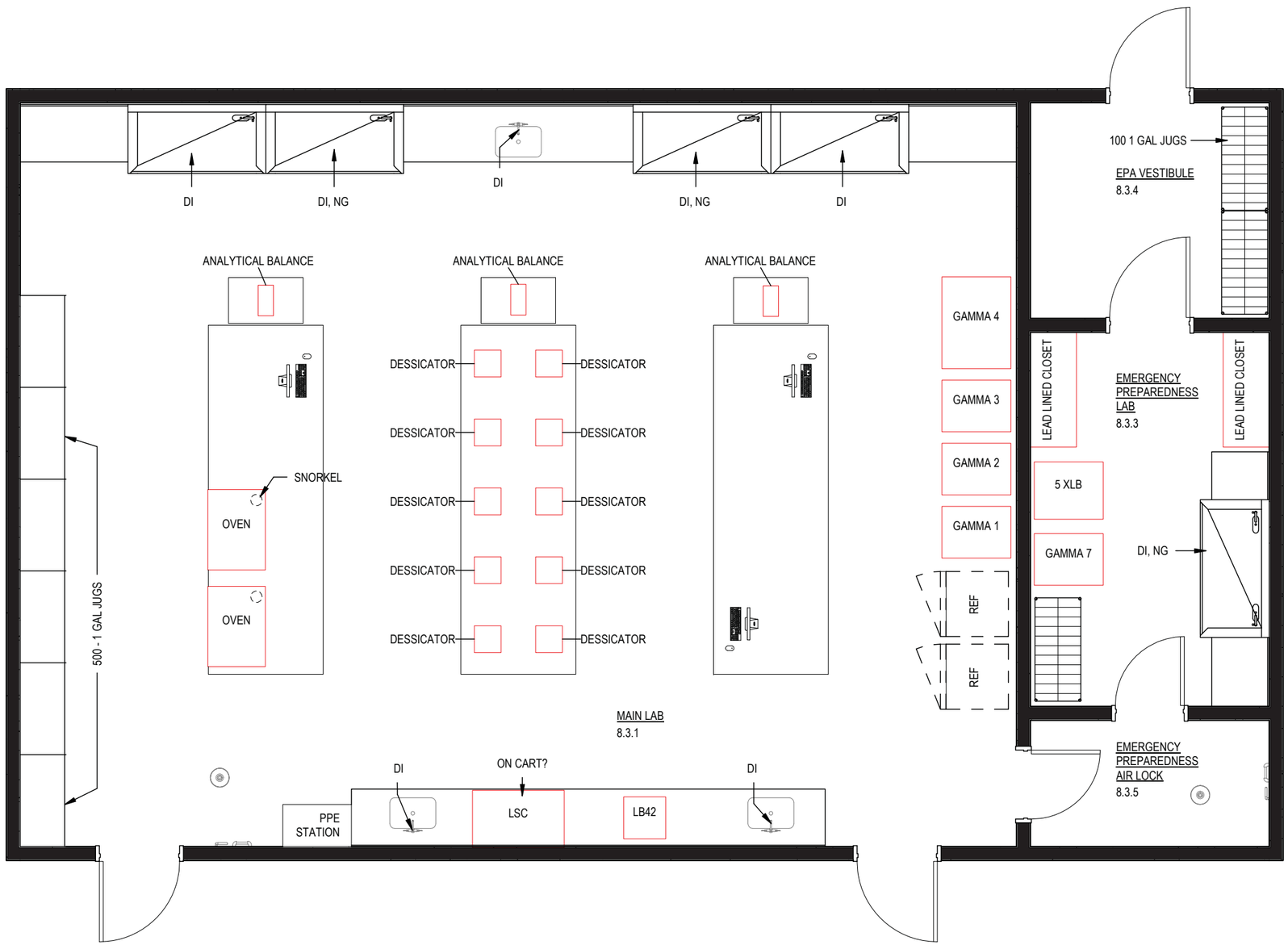
LAB STORAGE
363 NSF
Quantity: 0.67
243 NSF Total

FREEZER ROOM
363 NSF
Quantity: 0.5
182 NSF Total





RADIOCHEMISTRY



MAIN LAB + SAMPLE PREP LAB
363 NSF
Quantity: 4
1,452 NSF Total

EMERGENCY PREPAREDNESS LAB
363 NSF
Quantity: 1
363 NSF Total

EPA VESTIBULE
363 NSF
Quantity: 0.5
182 NSF Total

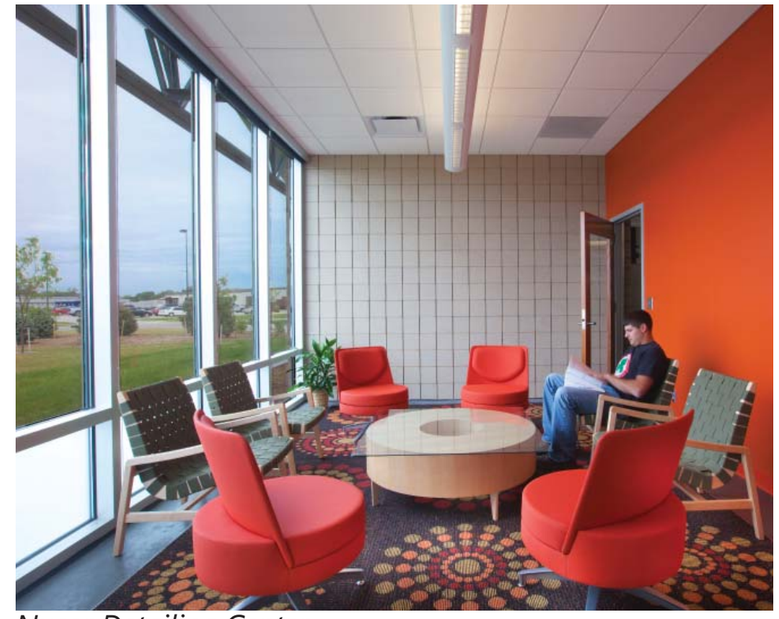
EMERGENCY PREPAREDNESS AIR LOCK
363 NSF
Quantity: 0.33
120 NSF Total

ADMINISTRATIVE, OFFICE, WORK ROOM + MEETING SPACES

Example diagrams are shown on the following pages that represent room layouts for administrative, office, work room and meeting spaces. The diagrams fit with space projections anticipated for KDHE in order to achieve space utilization similar to other peer institutions.

CSU Translational Medicine Institute

Viracor Laboratories



Nucor Detailing Center

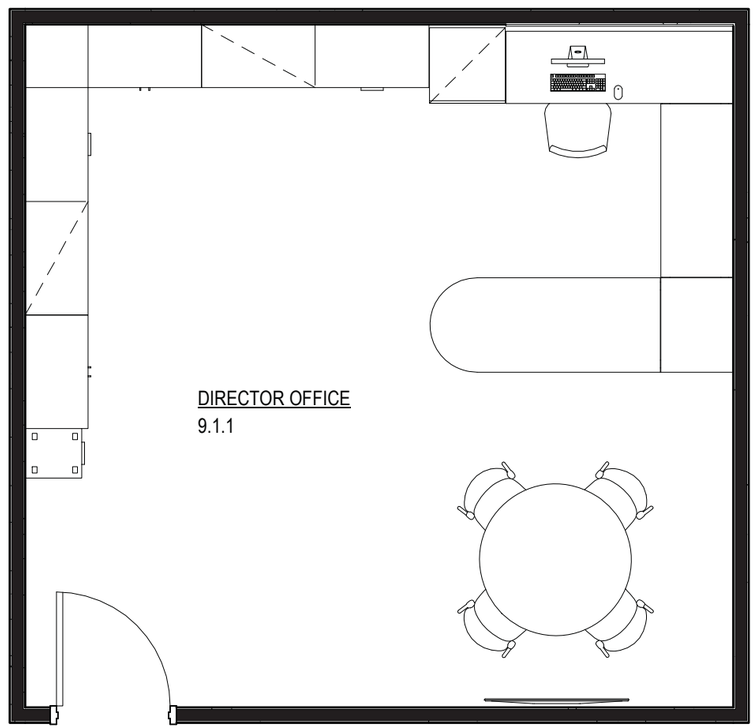
Runza Headquarters

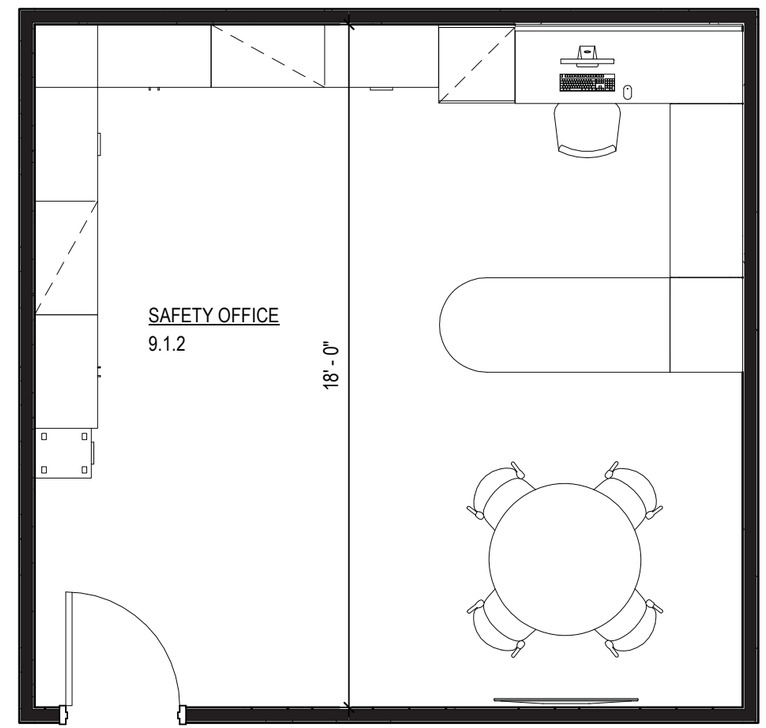
MS&T Bertelsmeyer Hall

ADMINISTRATIVE SUITE

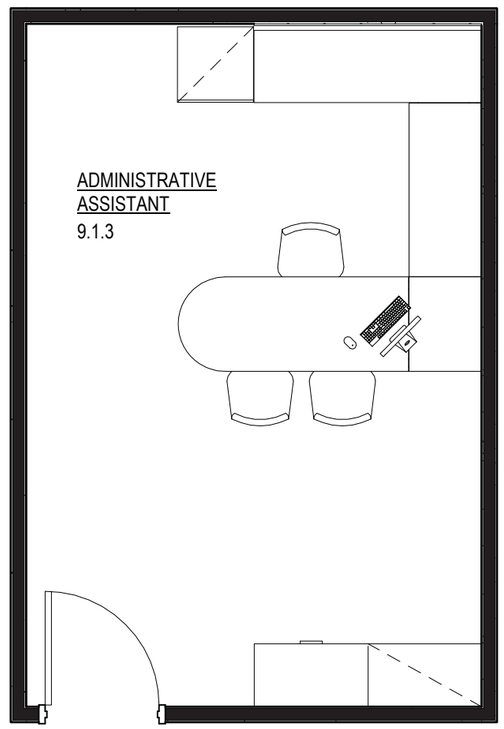
DIRECTOR OFFICE
350 NSF
Quantity: 1
350 NSF Total

SAFETY OFFICE
350 NSF
Quantity: 1
350 NSF Total





ADMINISTRATIVE SUITE



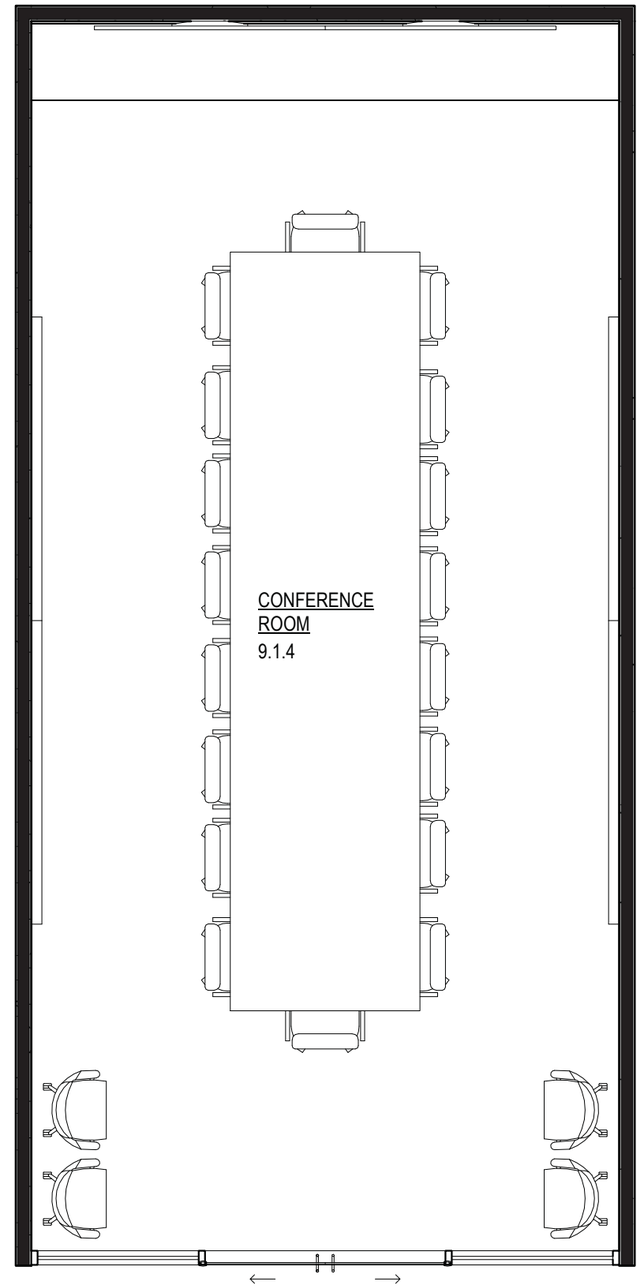
ADMINISTRATIVE ASSISTANT

225 NSF
Quantity: 1
225 NSF Total

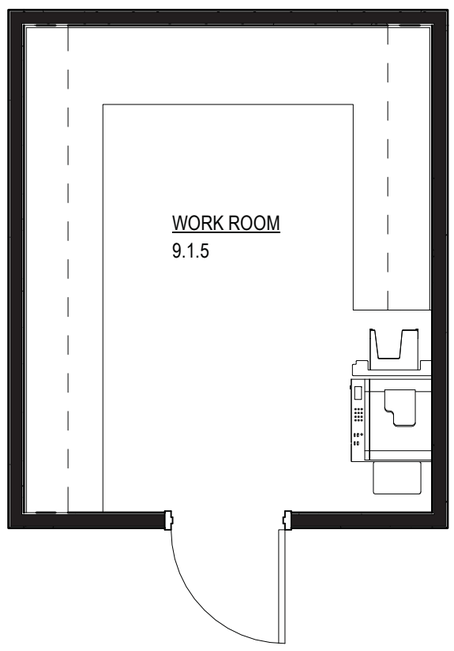
ADMINISTRATIVE SUITE

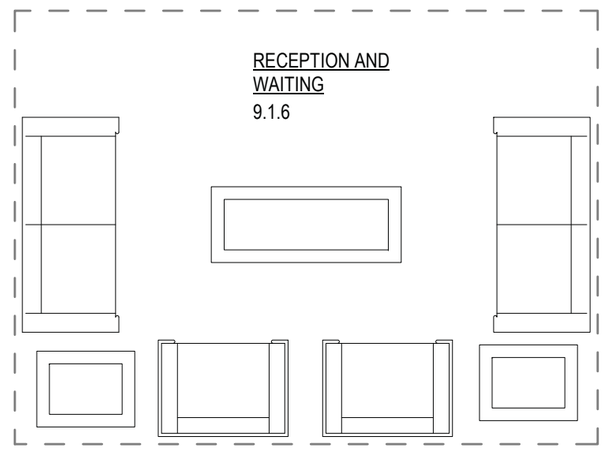
CONFERENCE ROOM

25 NSF
Quantity: 20
500 NSF Total
Capacity: 20
25 NSF / Occupant



ADMINISTRATIVE SUITE





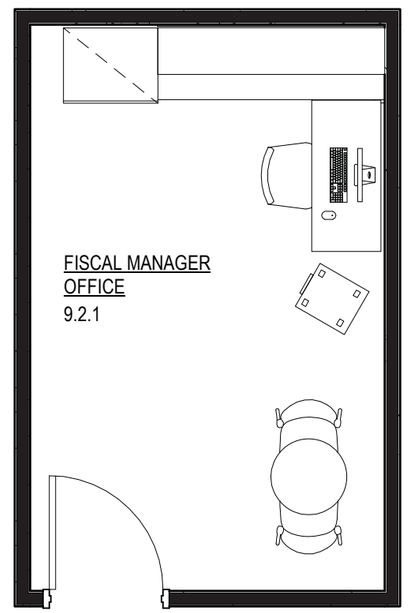
WORK ROOM
150 NSF
Quantity: 1
150 NSF Total

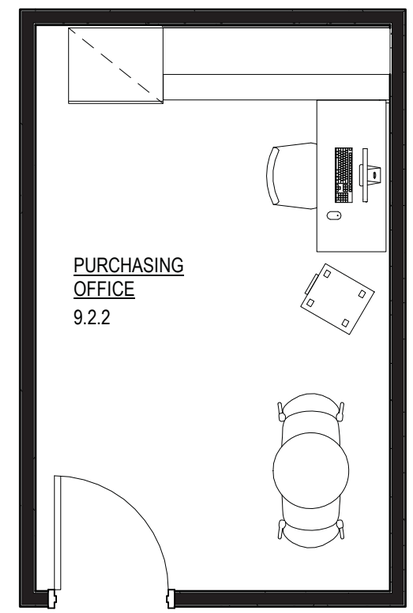
RECEPTION + WAITING
35 NSF
Quantity: 5
175 NSF Total

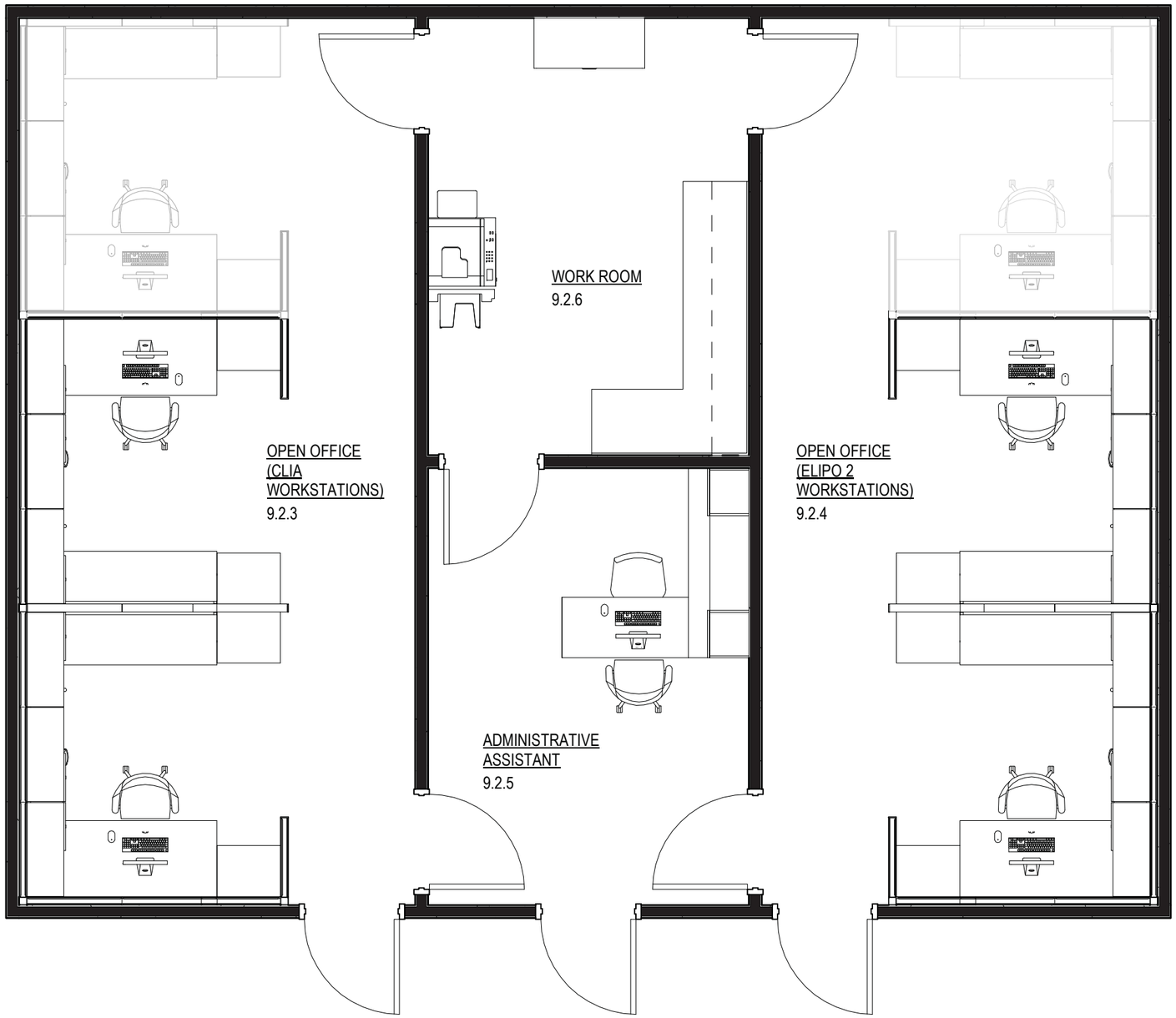
BUSINESS, CLIA + ELIPO

FISCAL MANAGER OFFICE
150 NSF
Quantity: 1
150 NSF Total

PURCHASING OFFICE
150 NSF
Quantity: 1
150 NSF Total







BUSINESS, CLIA + ELIPO

OPEN OFFICE CLIA WORKSTATIONS
75 NSF
Quantity: 3
225 NSF Total

OPEN OFFICE ELIPO WORKSTATIONS
75 NSF
Quantity: 3
225 NSF Total

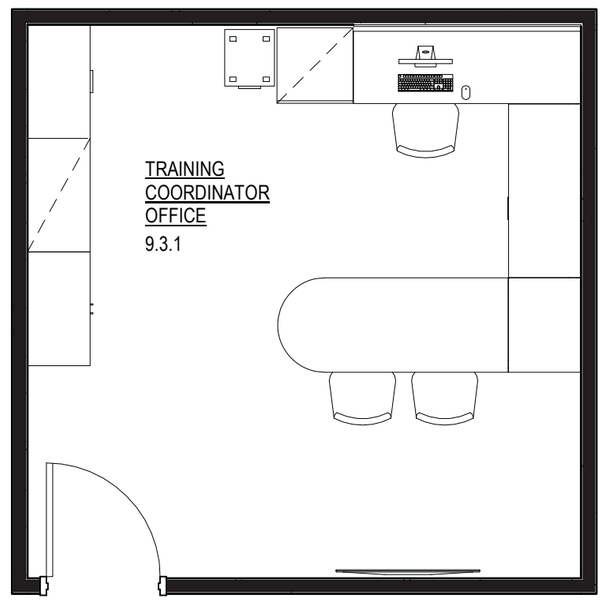
ADMINISTRATIVE ASSISTANT
150 NSF
Quantity: 1
150 NSF Total

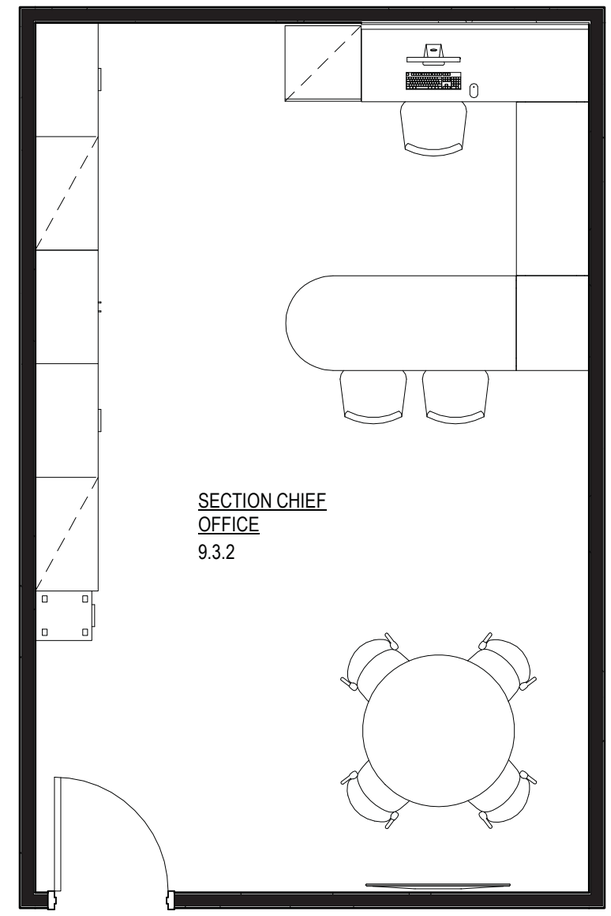
WORK ROOM
150 NSF
Quantity: 1
150 NSF Total

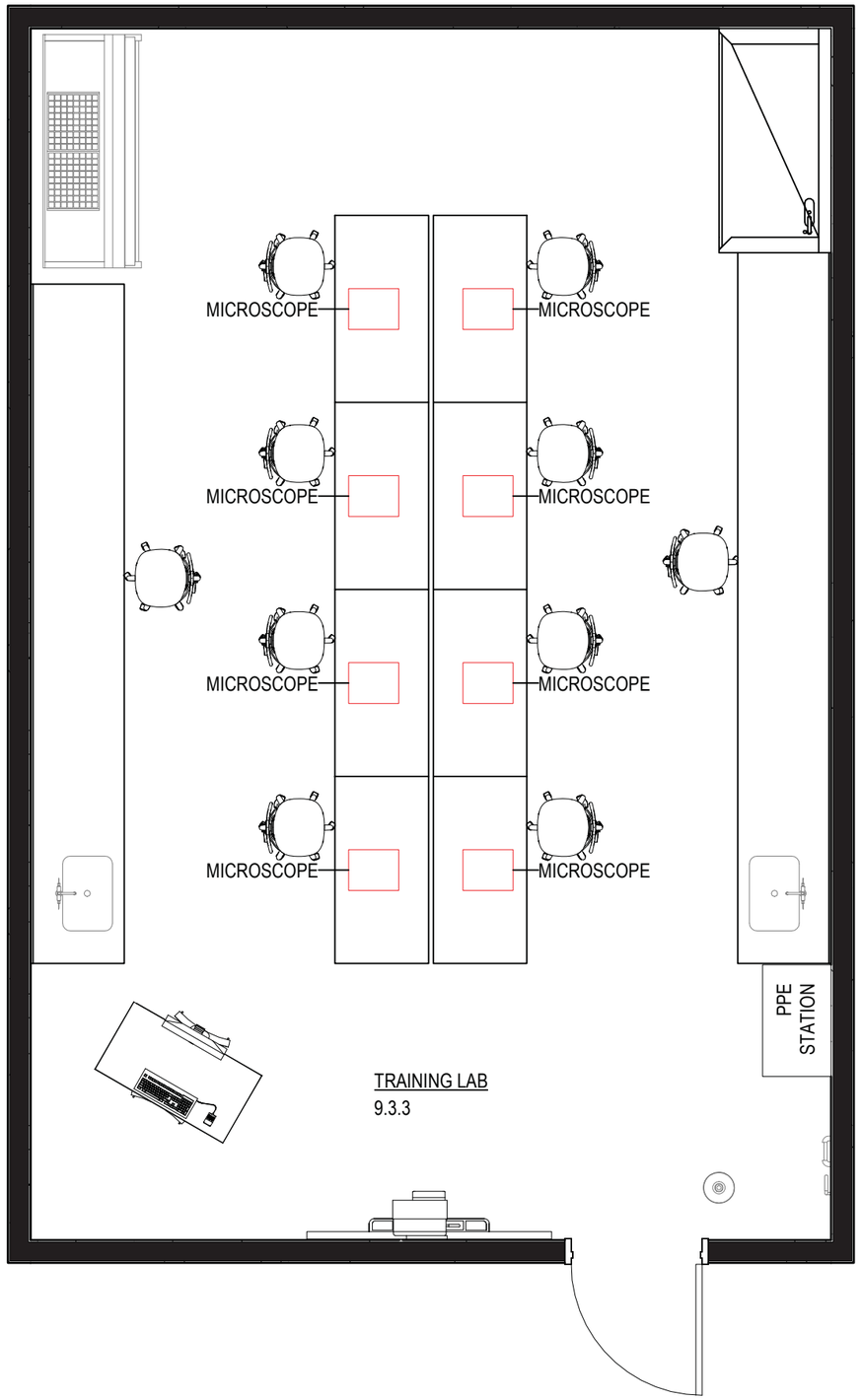
QUALITY ASSURANCE

TRAINING COORDINATOR OFFICE
225 NSF
Quantity: 1
225 NSF Total

SECTION CHIEF OFFICE
350 NSF
Quantity: 1
350 NSF Total







QUALITY ASSURANCE

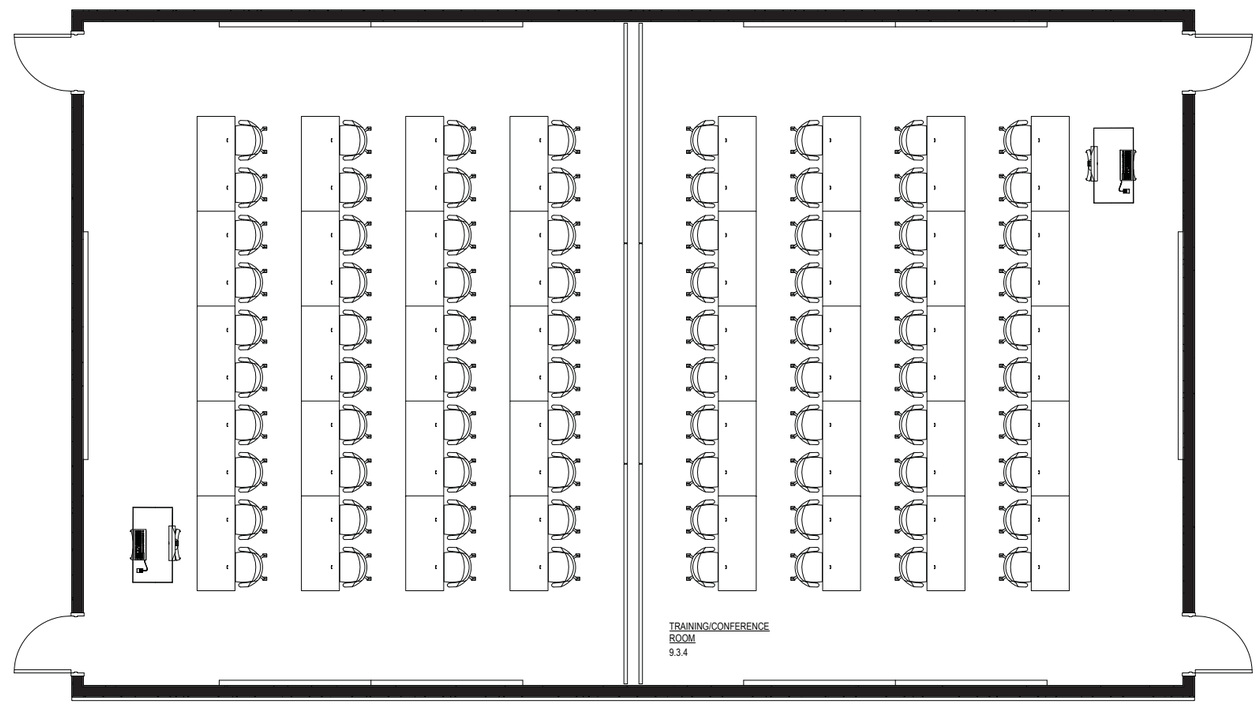
TRAINING LAB

363 NSF
Quantity: 2
725 NSF Total

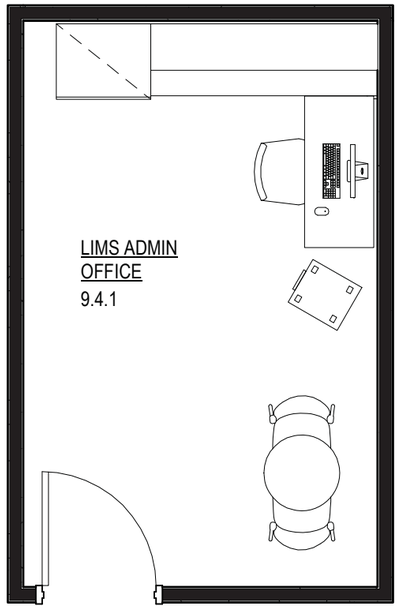
QUALITY ASSURANCE

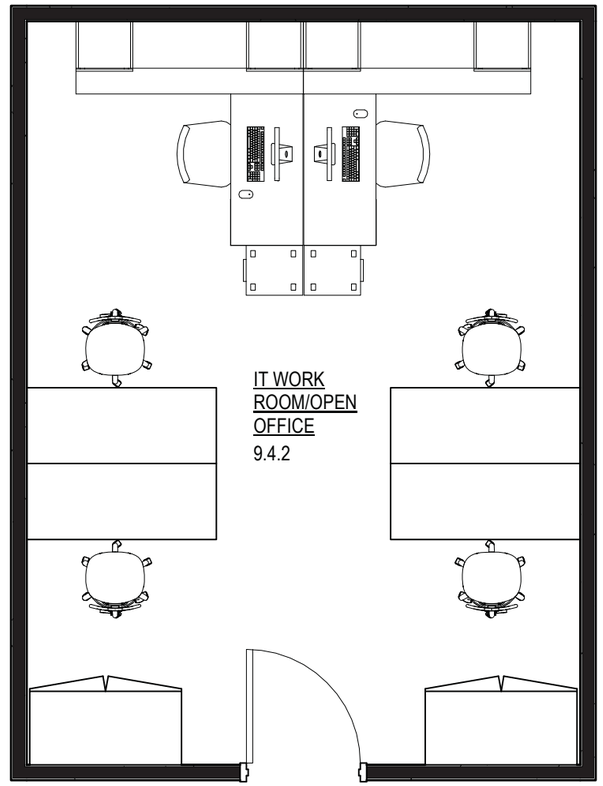
TRAINING + CONFERENCE ROOM

25 NSF
Quantity: 80
2,000 NSF Total
Capacity: 80
25 NSF / Occupant



IT + LIMS





LIMS ADMINISTRATIVE OFFICE

150 NSF
Quantity: 2
300 NSF Total

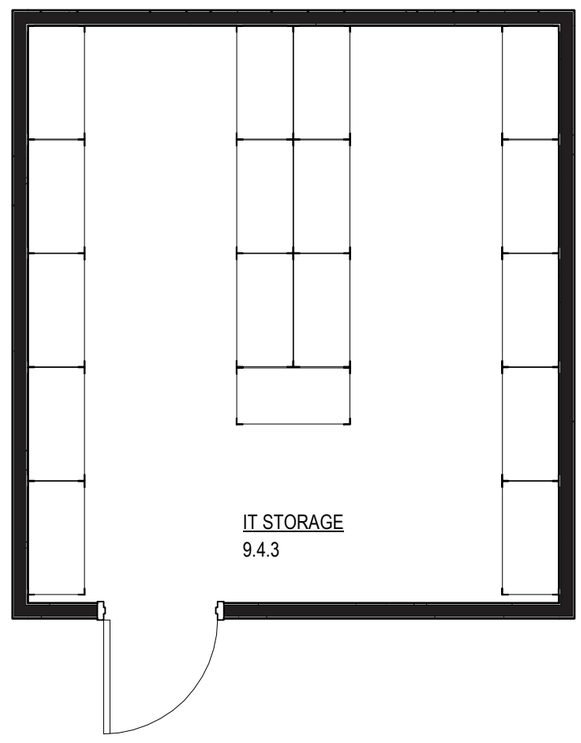
IT WORK ROOM OPEN OFFICE

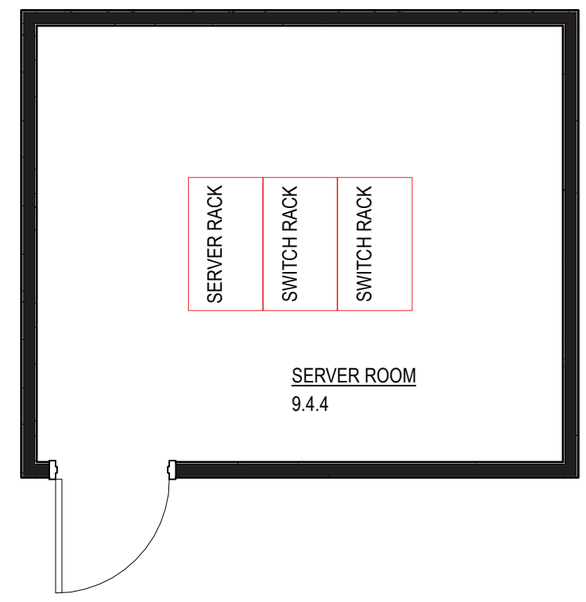
300 NSF
Quantity: 1
300 NSF Total

IT + LIMS

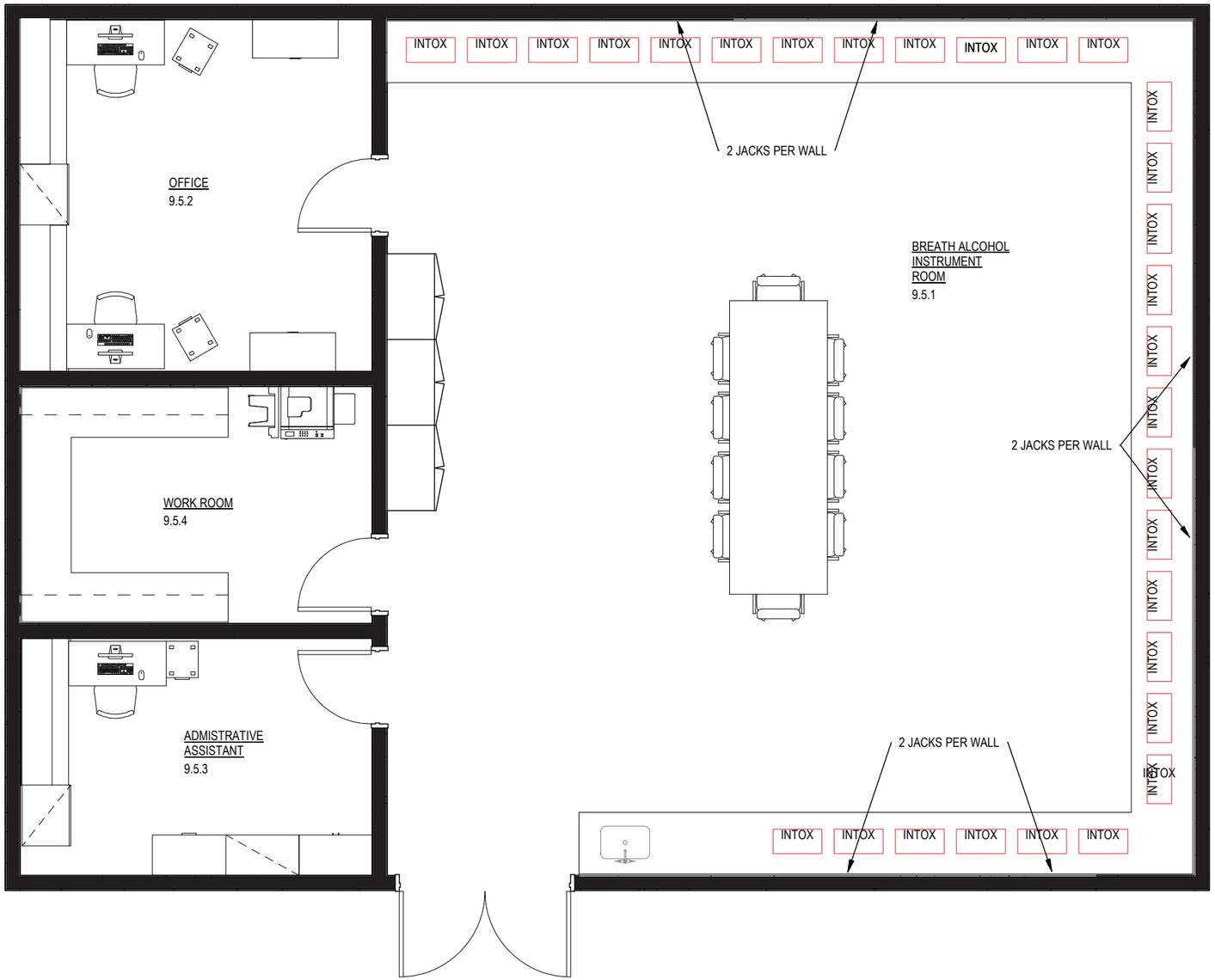
IT STORAGE
225 NSF
Quantity: 1
225 NSF Total

SERVER ROOM
160 NSF
Quantity: 1
160 NSF Total





BREATH ALCOHOL



BREATH ALCOHOL INSTRUMENT ROOM
1,200 NSF
Quantity: 1
1,200 NSF Total

OFFICE
75 NSF
Quantity: 3
225 NSF Total

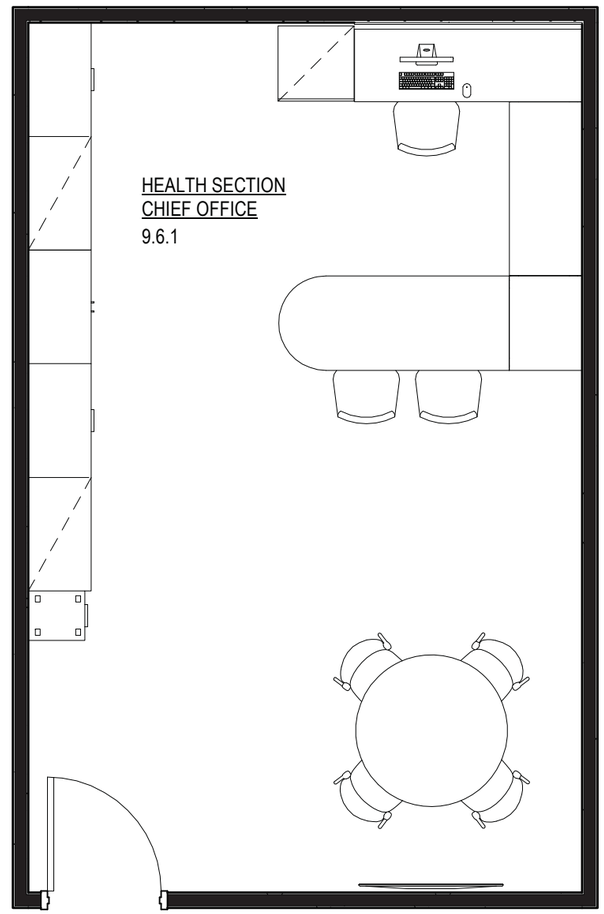
ADMINISTRATIVE ASSISTANT
300 NSF
Quantity: 1
300 NSF Total

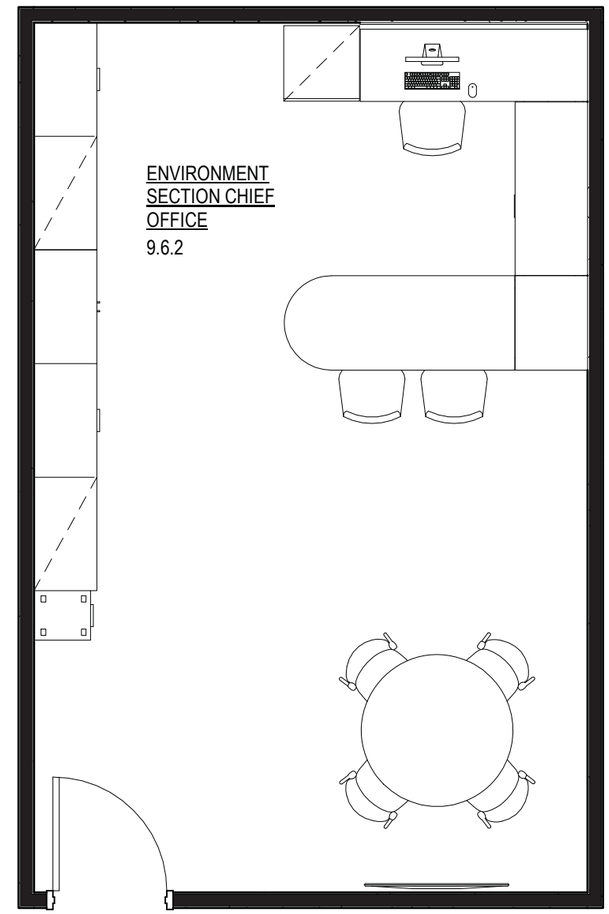
WORK ROOM
150 NSF
Quantity: 1
150 NSF Total

LABORATORY OFFICES

HEALTH SECTION CHIEF OFFICE
350 NSF
Quantity: 1
350 NSF Total

ENVIRONMENT SECTION CHIEF OFFICE
350 NSF
Quantity: 1
350 NSF Total

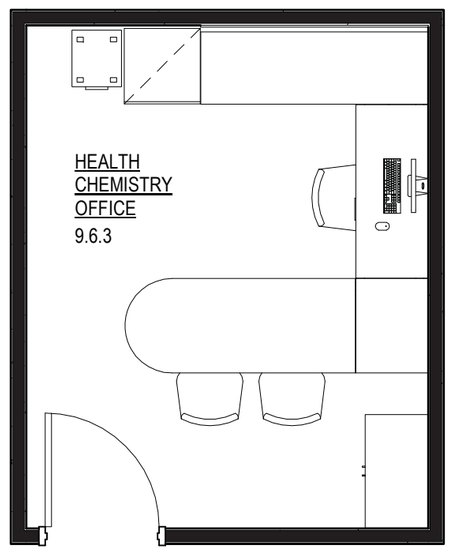




LABORATORY OFFICES

HEALTH CHEMISTRY OFFICE

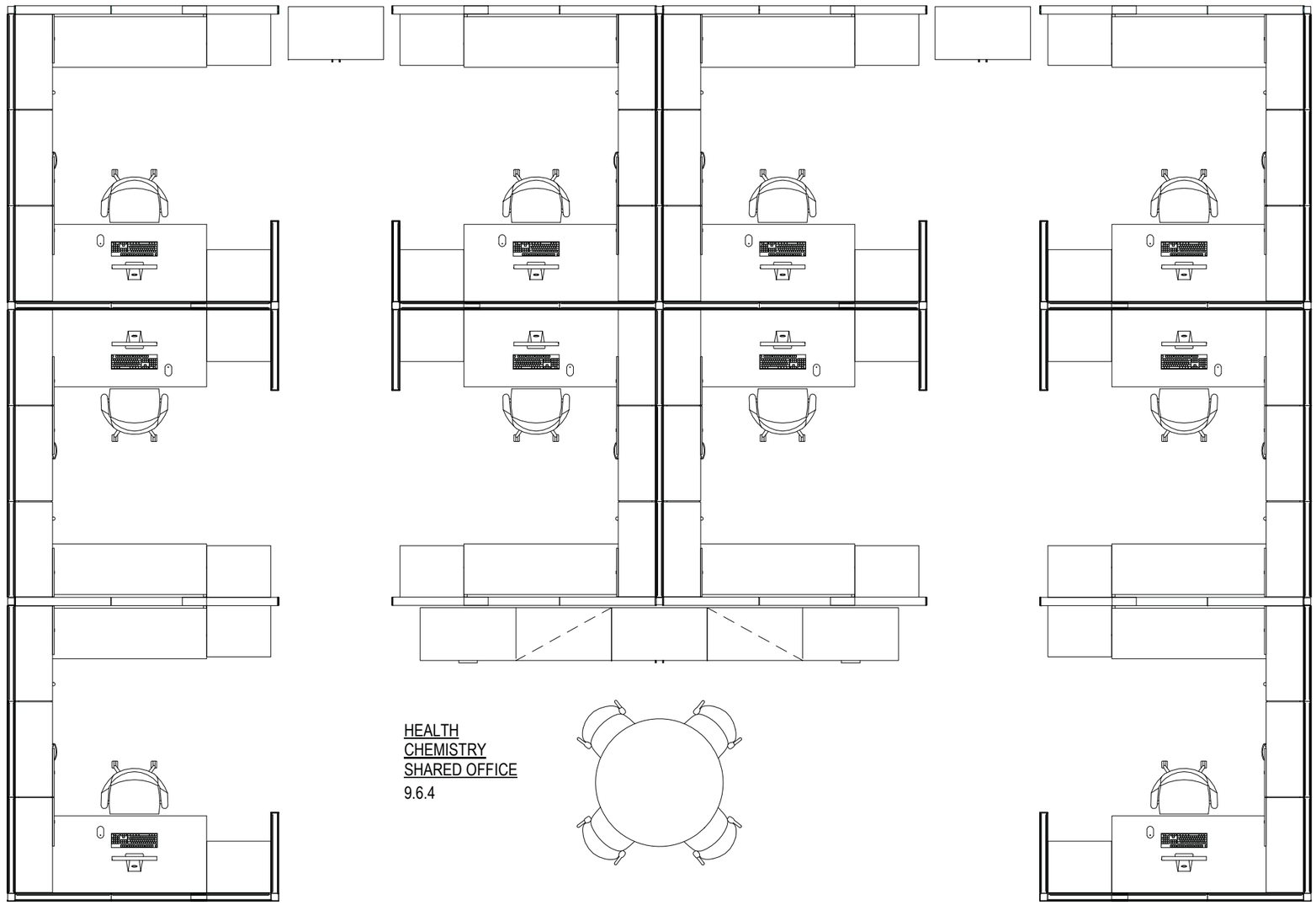
150 NSF
Quantity: 1
150 NSF Total



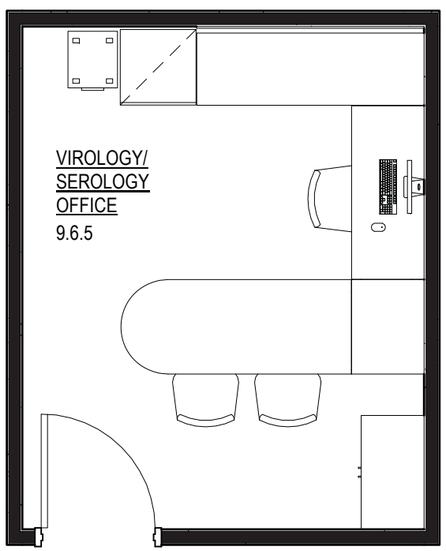
LABORATORY OFFICES

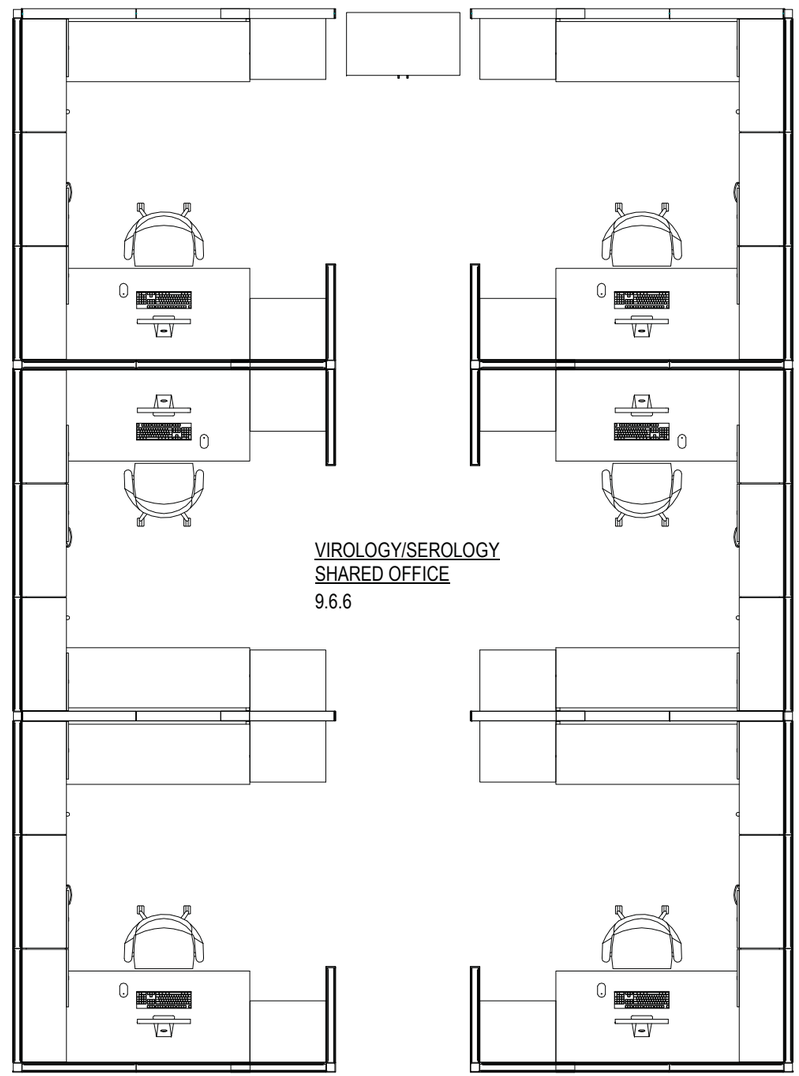
HEALTH CHEMISTRY SHARED OFFICE

75 NSF
Quantity: 10
750 NSF Total



LABORATORY OFFICES





VIROLOGY + SEROLOGY OFFICE

150 NSF
Quantity: 1
150 NSF Total

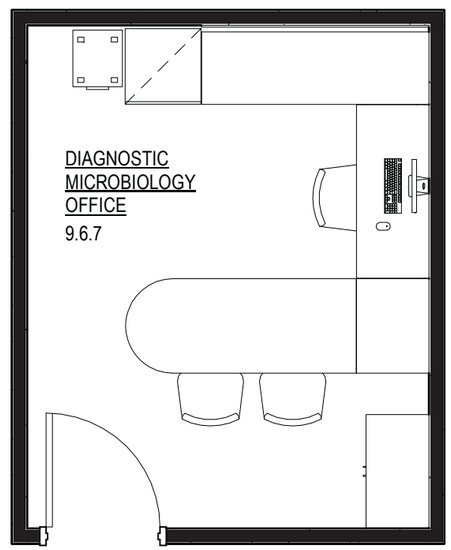
VIROLOGY + SEROLOGY SHARED OFFICE

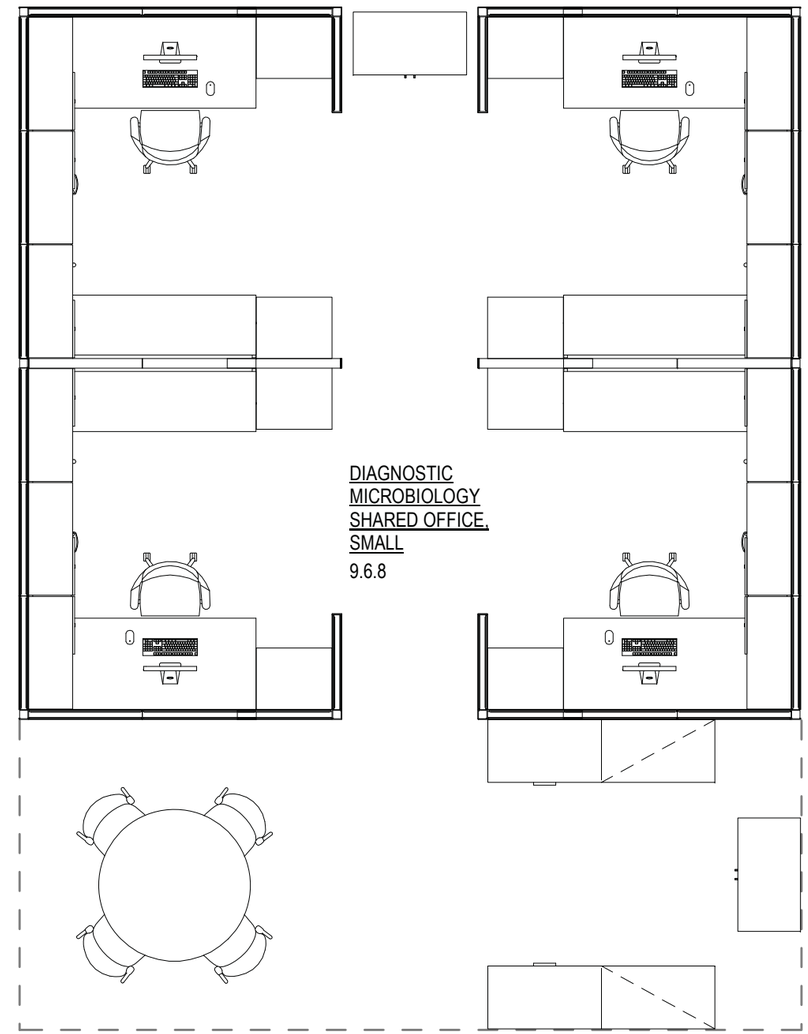
75 NSF
Quantity: 6
450 NSF Total

LABORATORY OFFICES

DIAGNOSTIC MICROBIOLOGY OFFICE
150 NSF
Quantity: 1
150 NSF Total

DIAGNOSTIC MICROBIOLOGY SHARED OFFICE (SMALL)
100 NSF
Quantity: 4
400 NSF Total

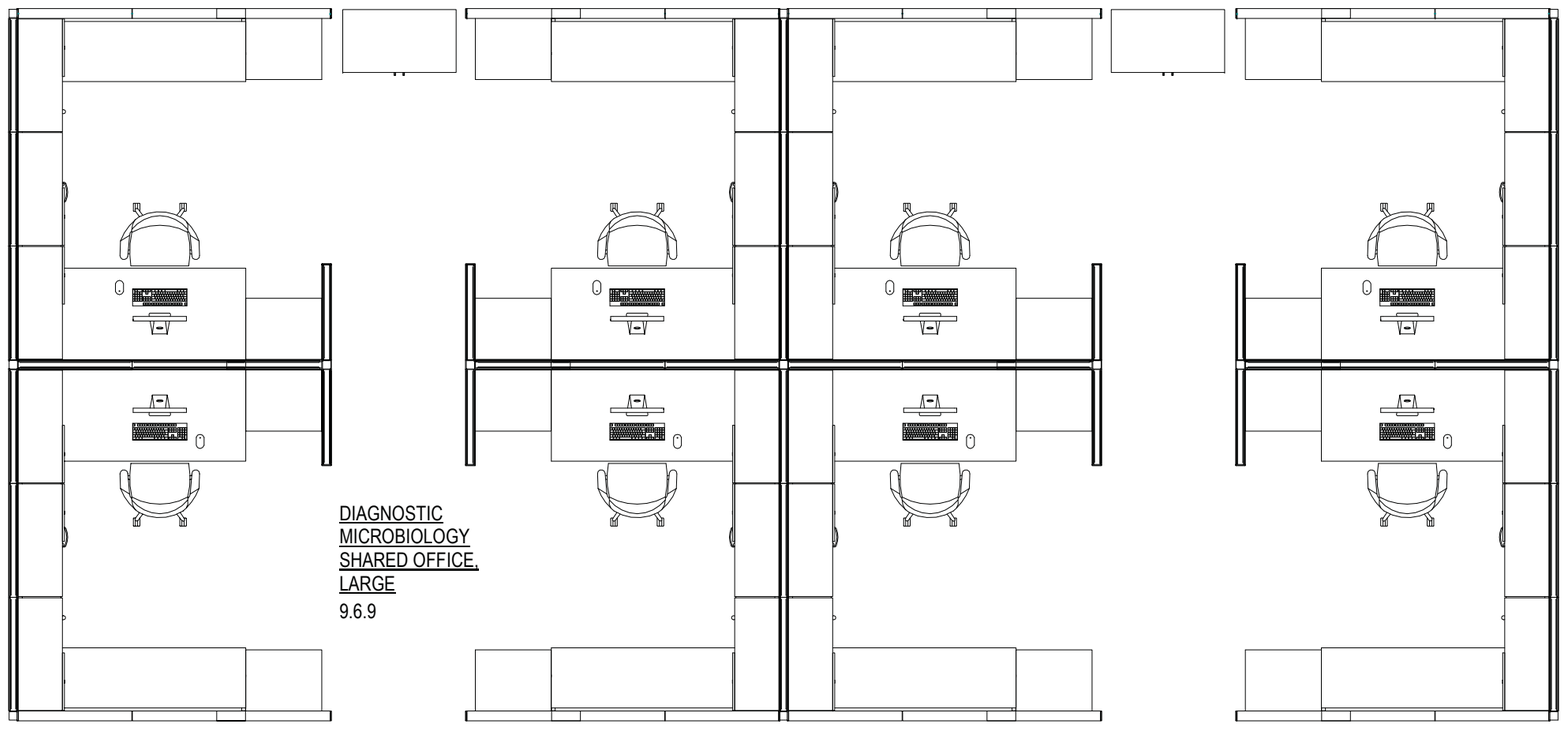




LABORATORY OFFICES

DIAGNOSTIC MICROBIOLOGY SHARED OFFICE (LARGE)

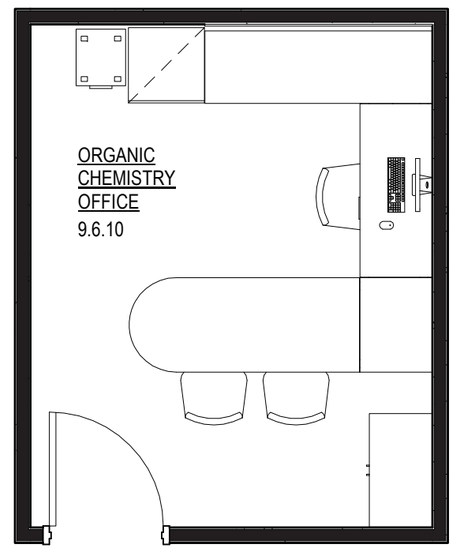
75 NSF
Quantity: 8
600 NSF Total

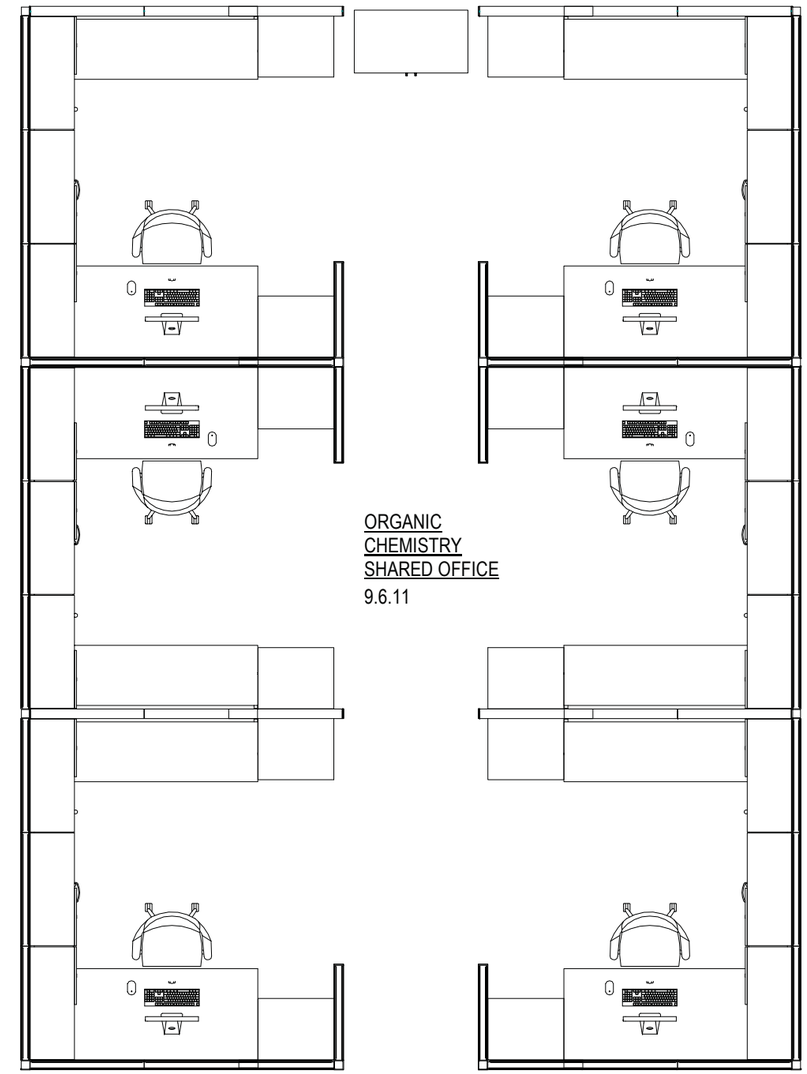


LABORATORY OFFICES

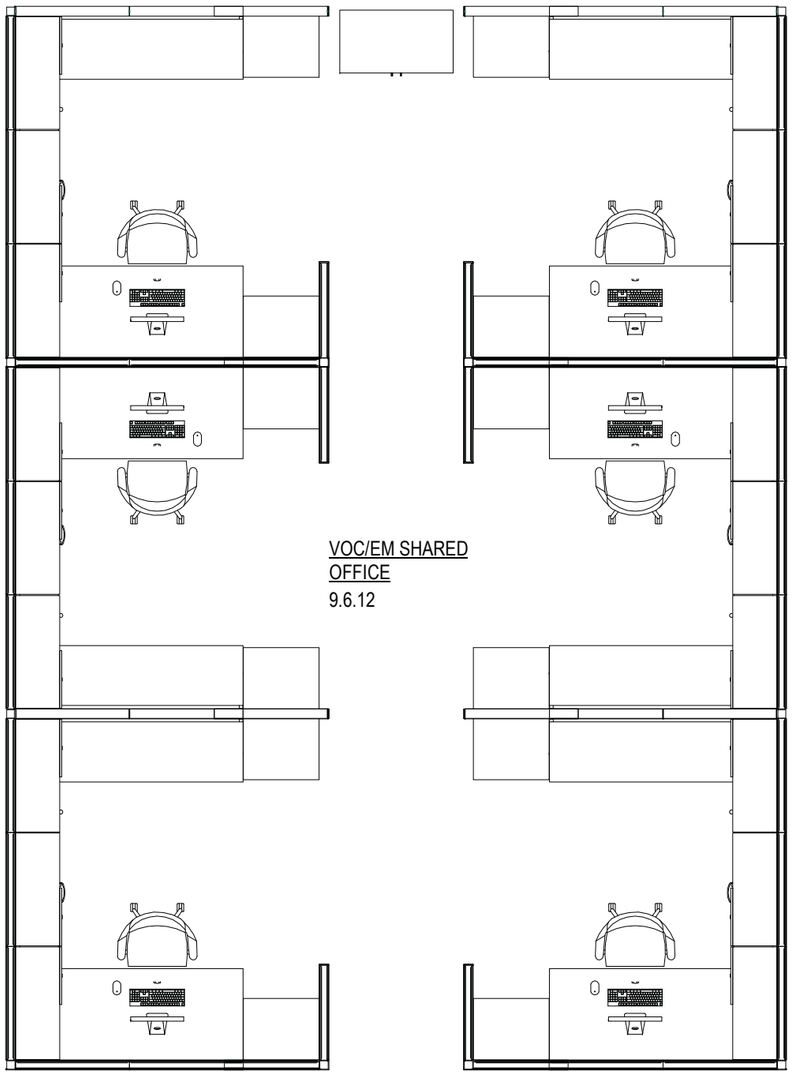
ORGANIC CHEMISTRY OFFICE
150 NSF
Quantity: 1
150 NSF Total

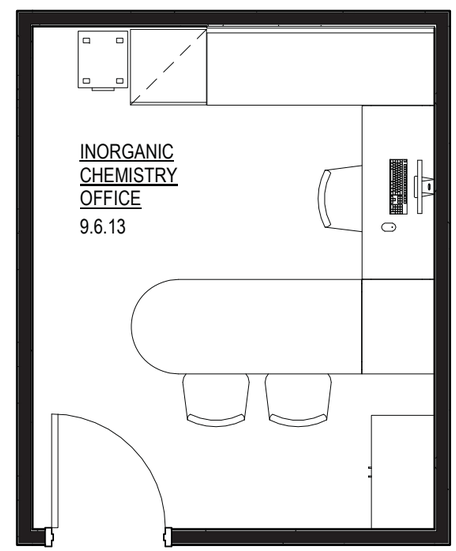
ORGANIC CHEMISTRY SHARED OFFICE
75 NSF
Quantity: 6
450 NSF Total





LABORATORY OFFICES





VOC + EM SHARED OFFICE

75 NSF
Quantity: 6
450 NSF Total

INORGANIC CHEMISTRY OFFICE

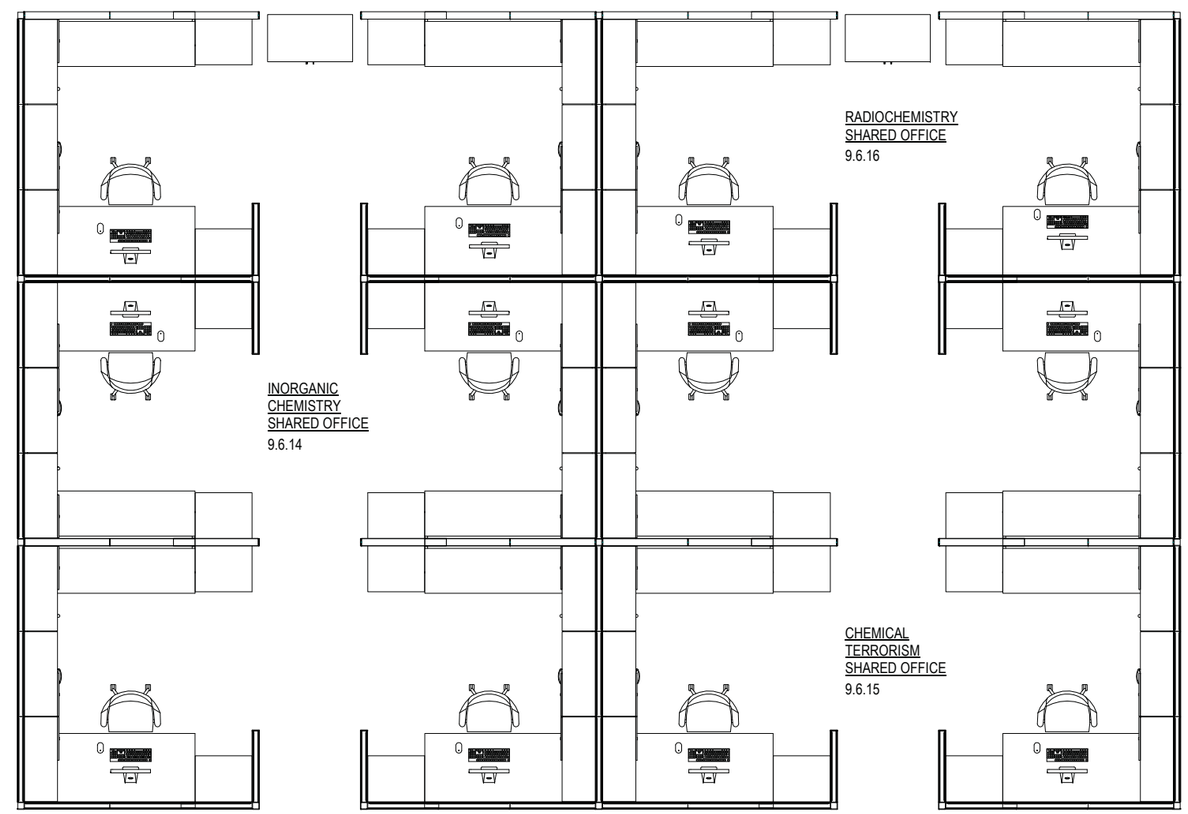
150 NSF
Quantity: 1
150 NSF Total

LABORATORY OFFICES

INORGANIC CHEMISTRY SHARED OFFICE
75 NSF
Quantity: 5
375 NSF Total

CHEMICAL TERRORISM SHARED OFFICE
100 NSF
Quantity: 3
300 NSF Total

RADIOCHEMISTRY SHARED OFFICE
100 NSF
Quantity: 4
400 NSF Total

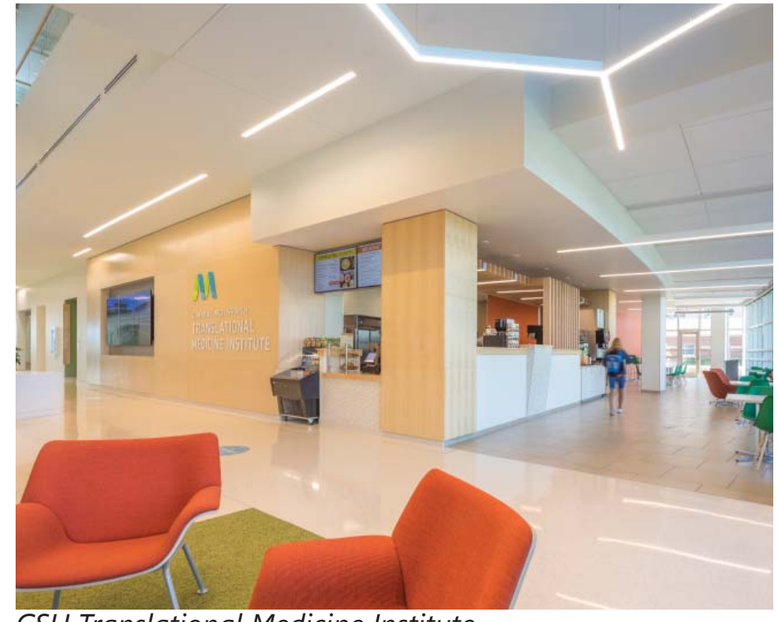


SHARED SPACES, MAINTENANCE + HOUSEKEEPING

Example diagrams are shown on the following pages that represent room layouts for shared space and building support, such as maintenance and housekeeping. The diagrams fit with space projections anticipated for KDHE in order to achieve space utilization similar to other peer institutions.

Nucor Detailing Center

NWU Acklie Hall of Science



CSU Translational Medicine Institute

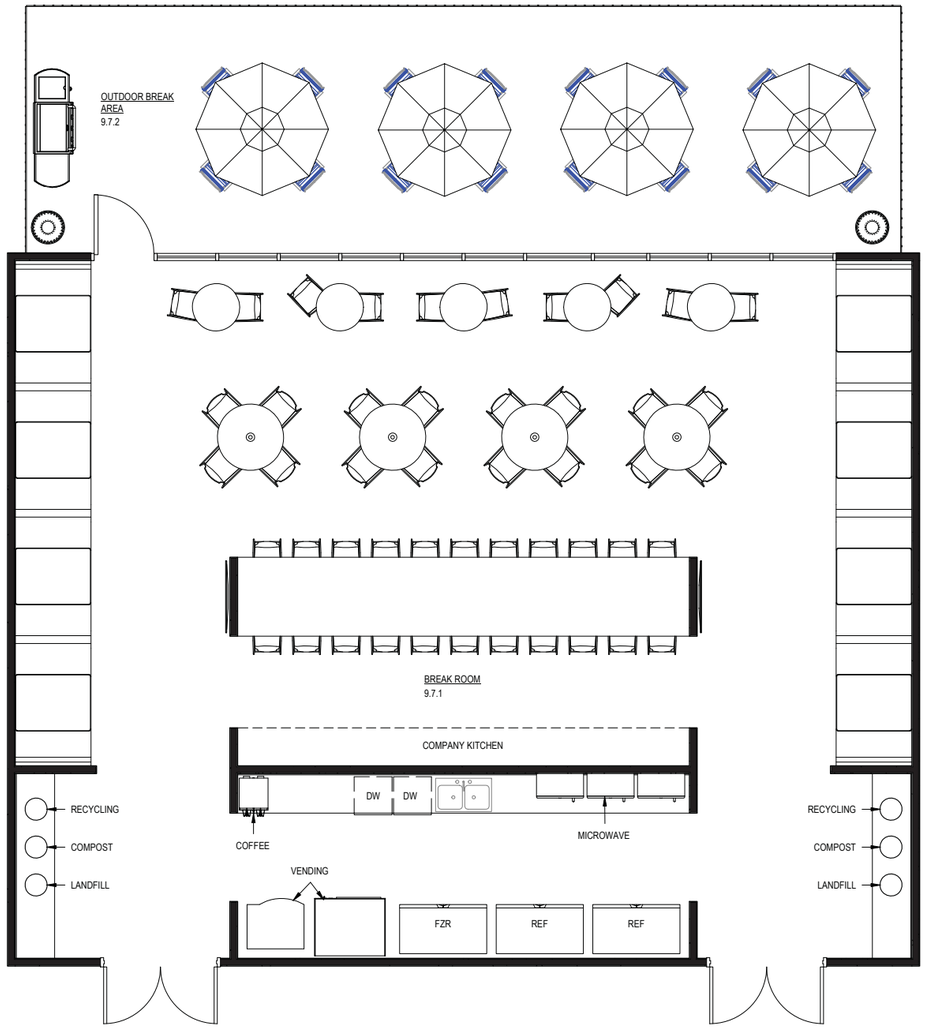
Geist Manufacturing

Runza Headquarters

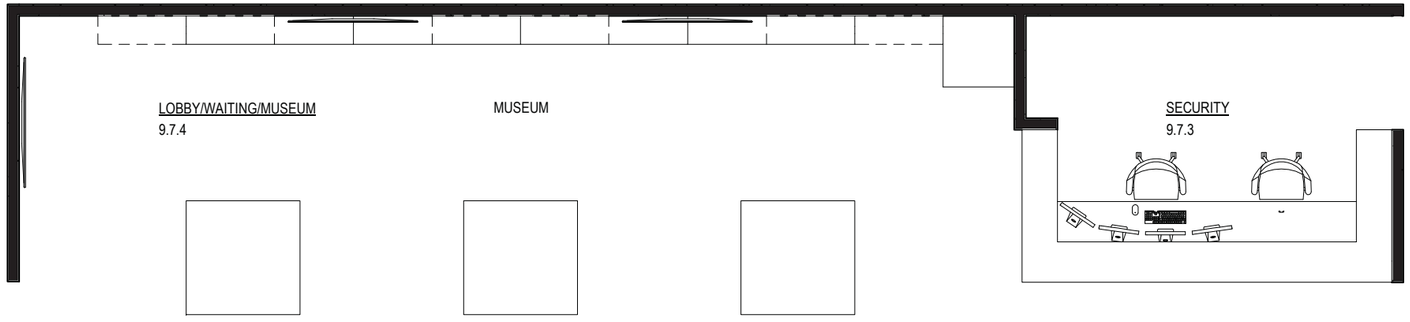
SHARED SPACE

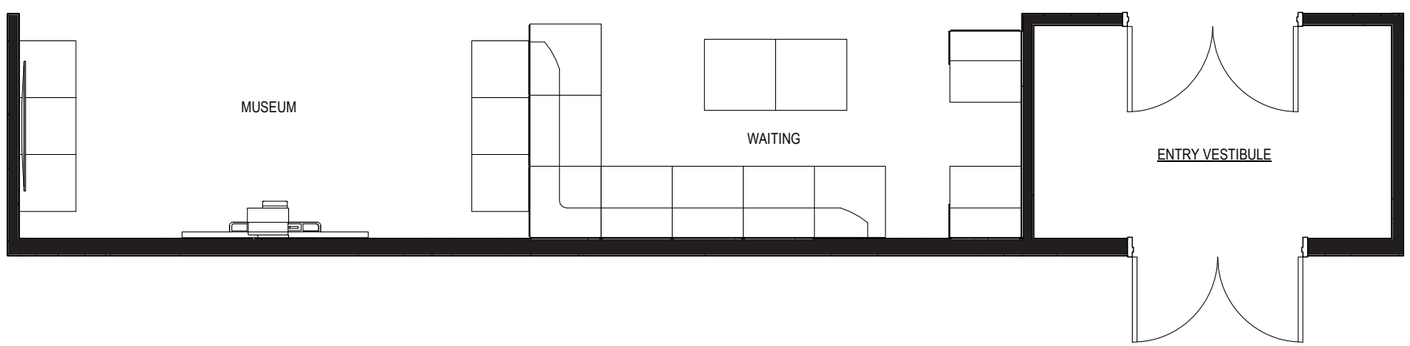
BREAK ROOM
25 NSF
Quantity: 80
2,000 NSF Total
Capacity: 80
25 NSF / Occupant

OUTDOOR BREAK AREA
400 NSF
Quantity: 1
400 NSF Total
Capacity: 24
25 NSF / Occupant



SHARED SPACE





LOBBY, WAITING + MUSEUM

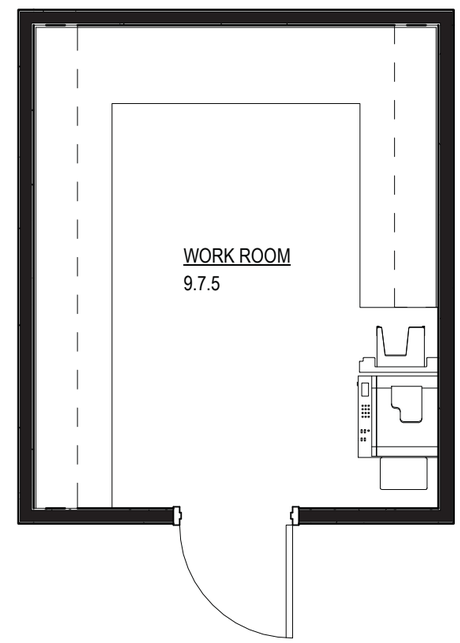
600 NSF
Quantity: 1
600 NSF Total

SECURITY

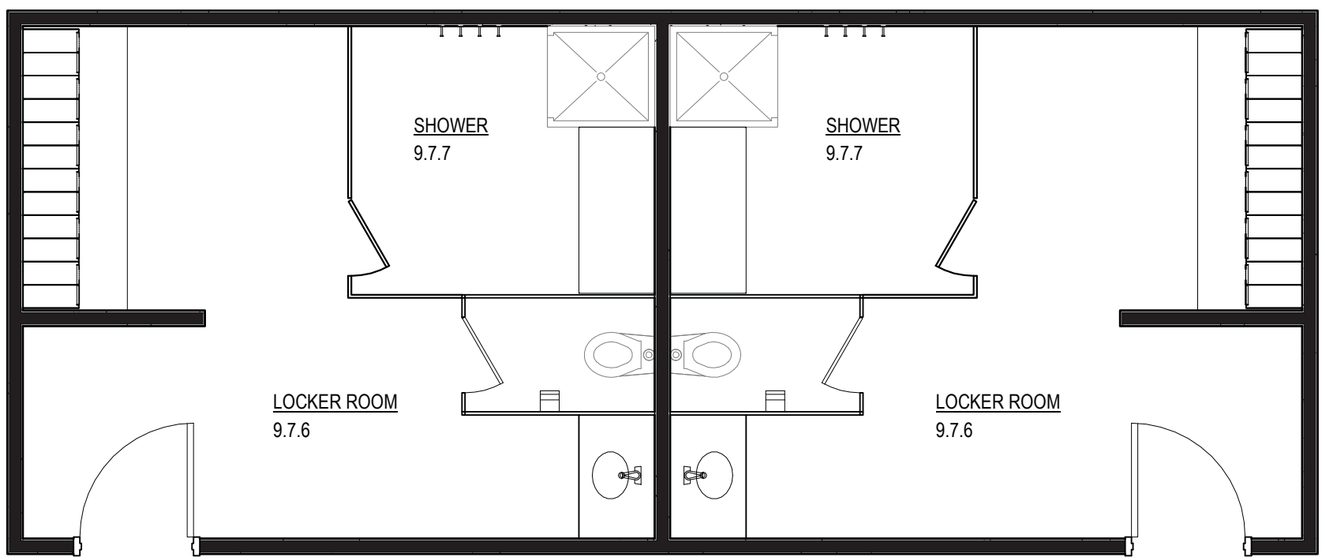
150 NSF
Quantity: 1
150 NSF Total

SHARED SPACE

WORK ROOM
600 NSF
Quantity: 1
600 NSF Total



SHARED SPACE

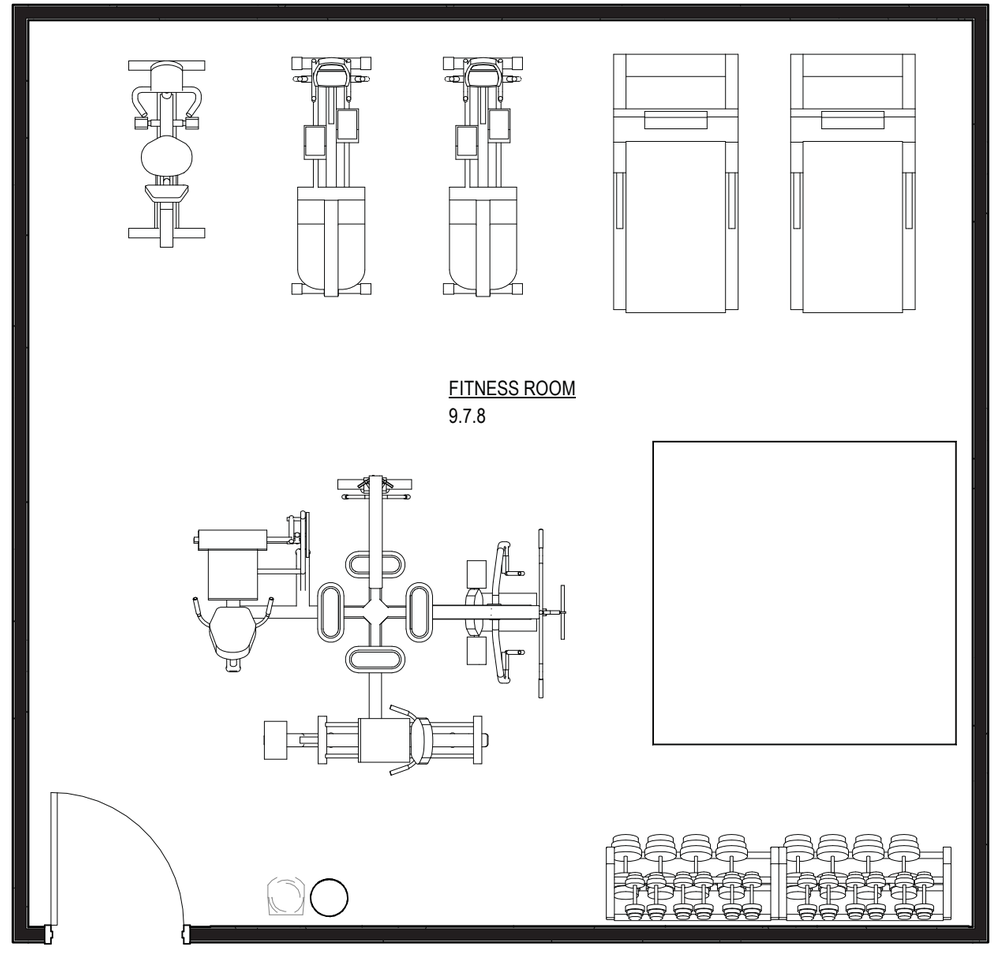


LOCKER ROOM
150 NSF
Quantity: 2
300 NSF Total

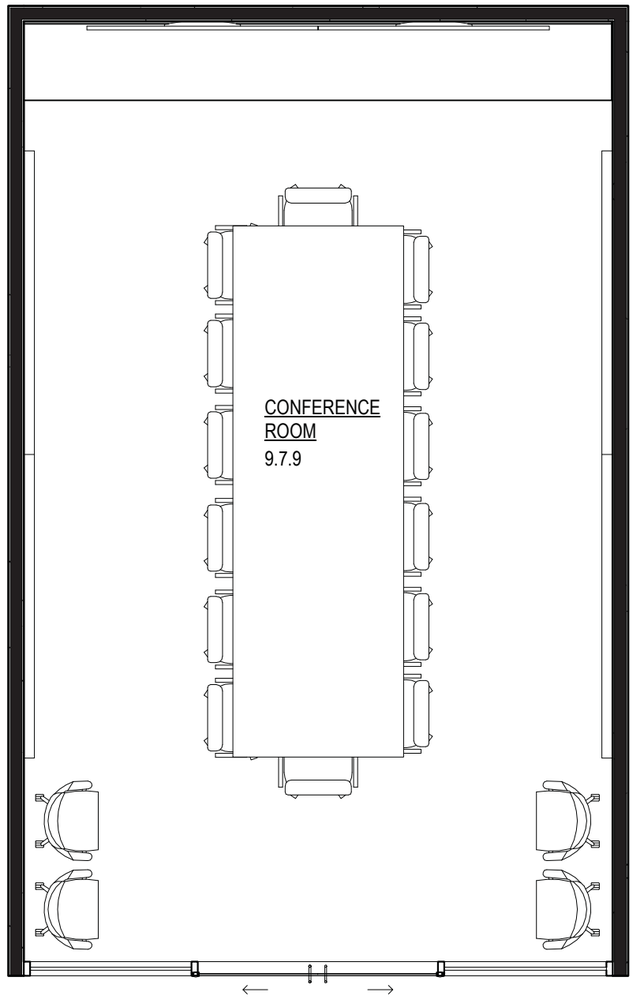
SHOWER
75 NSF
Quantity: 2
150 NSF Total

SHARED SPACE

FITNESS ROOM
600 NSF
Quantity: 1
600 NSF Total



SHARED SPACE



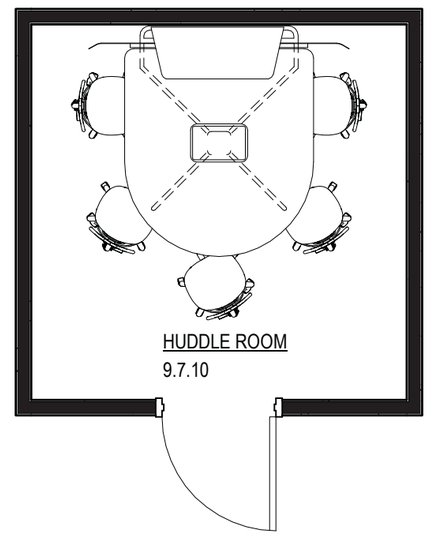
CONFERENCE ROOM

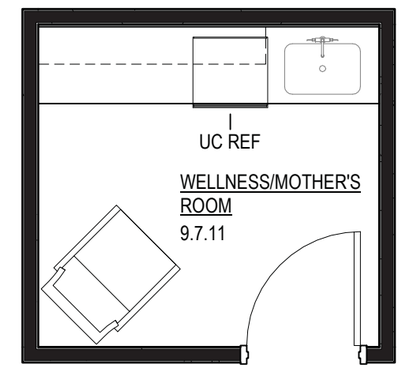
25 NSF
Quantity: 16
400 NSF Total
Capacity: 16
25 NSF / Occupant

SHARED SPACE

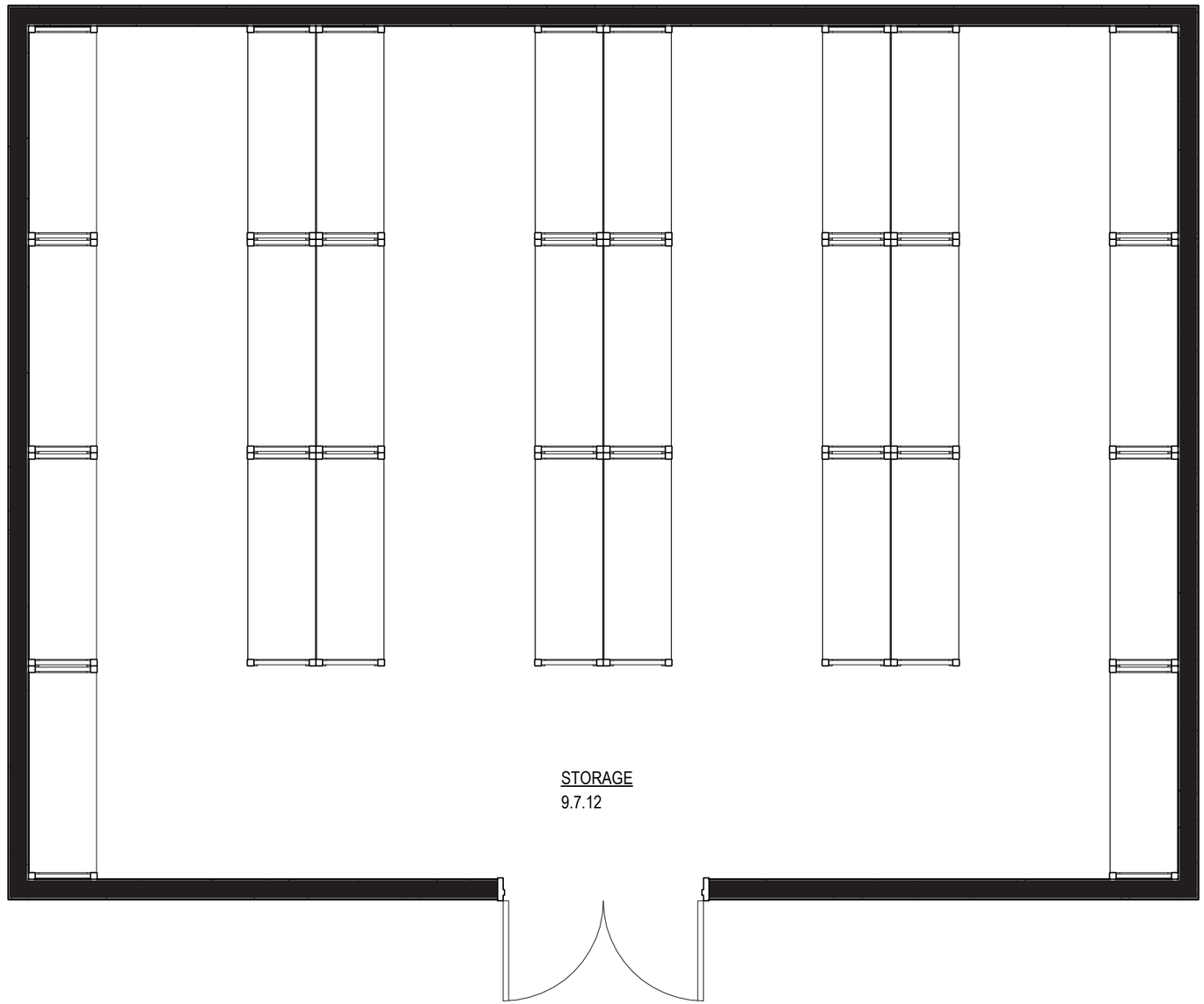
HUDDLE ROOM
100 NSF
Quantity: 6
600 NSF Total

WELLNESS + MOTHER'S ROOM
75 NSF
Quantity: 1
75 NSF Total





SHARED SPACE



STORAGE

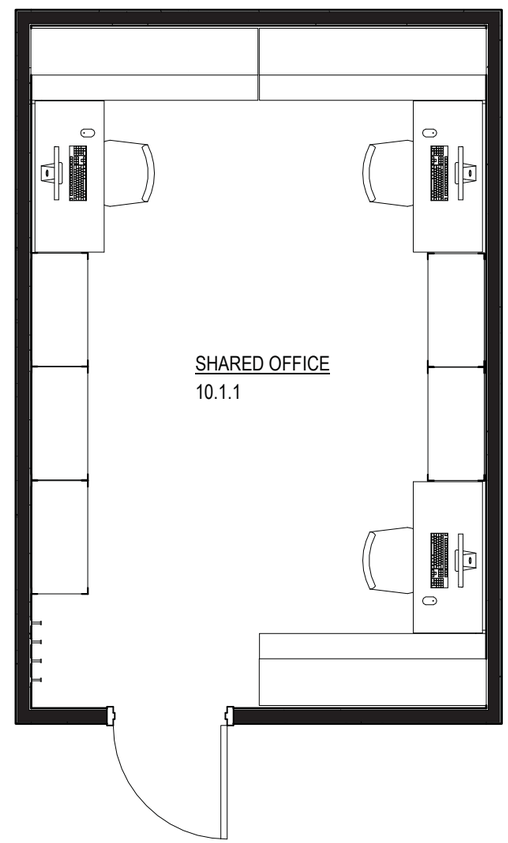
900 NSF
Quantity: 1
900 NSF Total

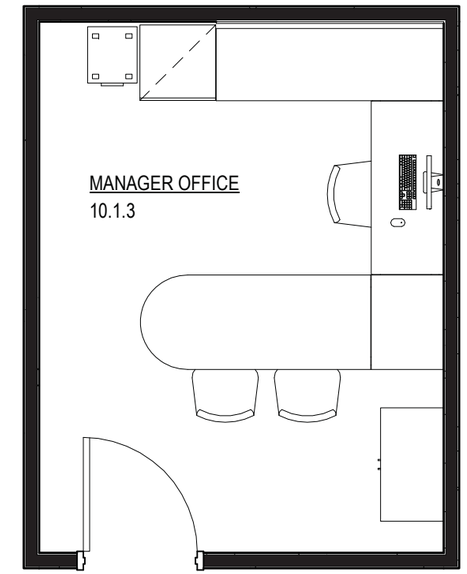
BUILDING SUPPORT

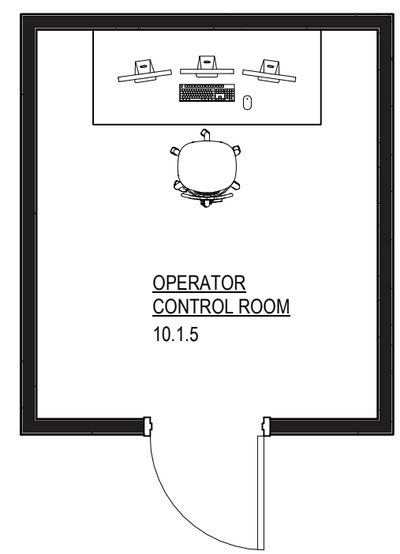
SHARED OFFICE
75 NSF
Quantity: 3
225 NSF Total

MANAGER OFFICE
160 NSF
Quantity: 1
160 NSF Total

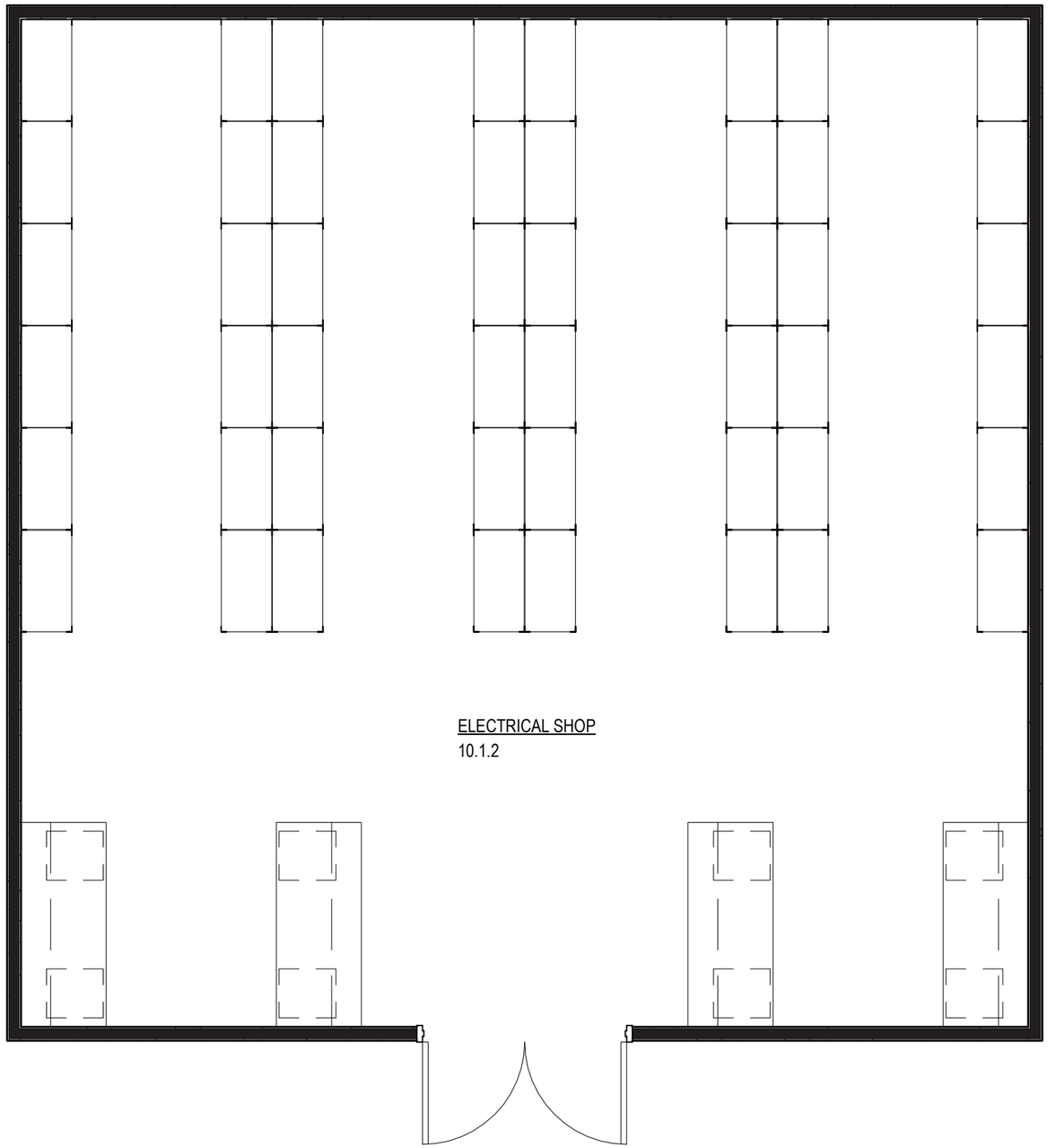
OPERATOR CONTROL ROOM
100 NSF
Quantity: 1
100 NSF Total







BUILDING SUPPORT



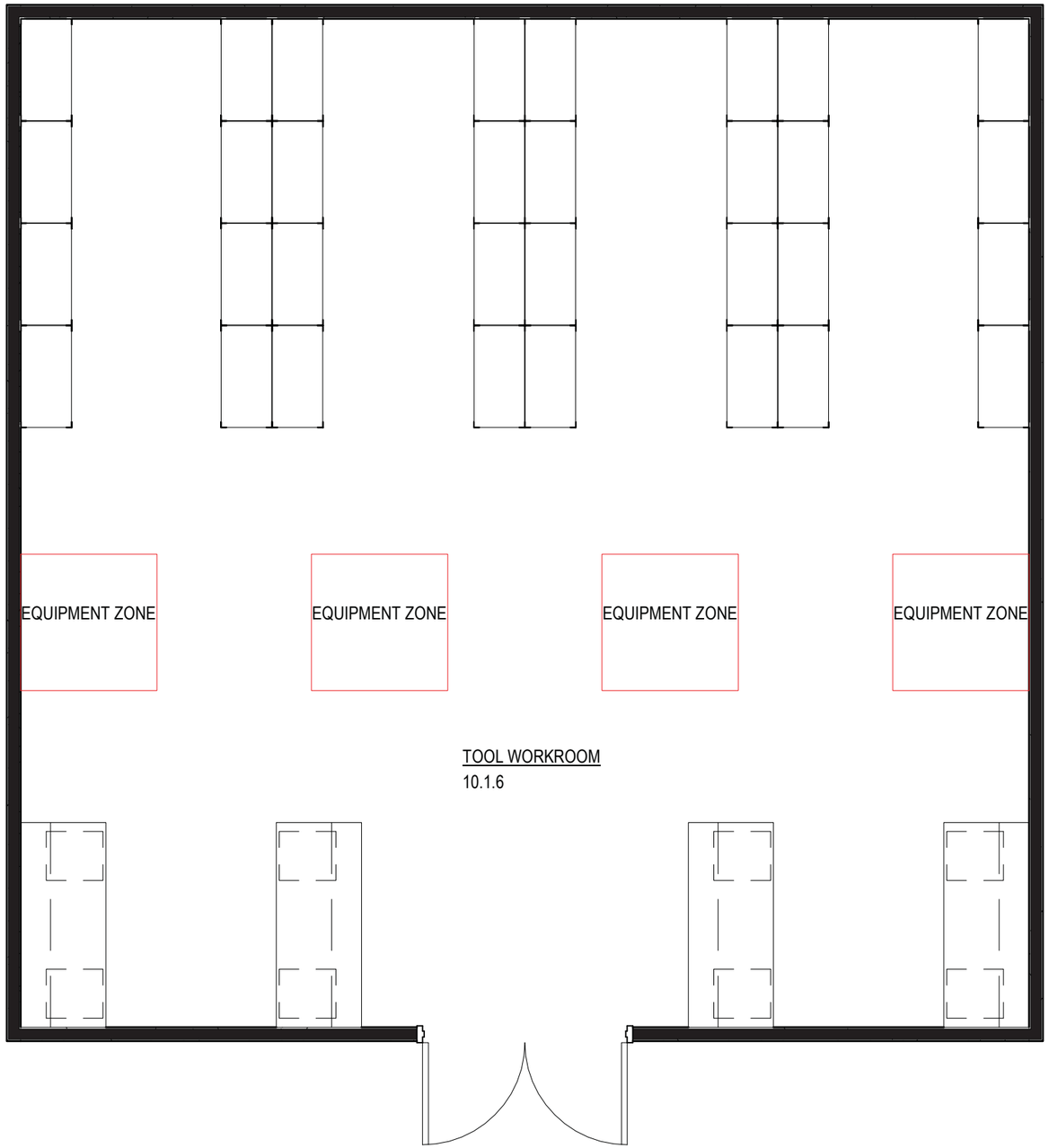
ELECTRICAL SHOP

900 NSF
Quantity: 1
900 NSF Total

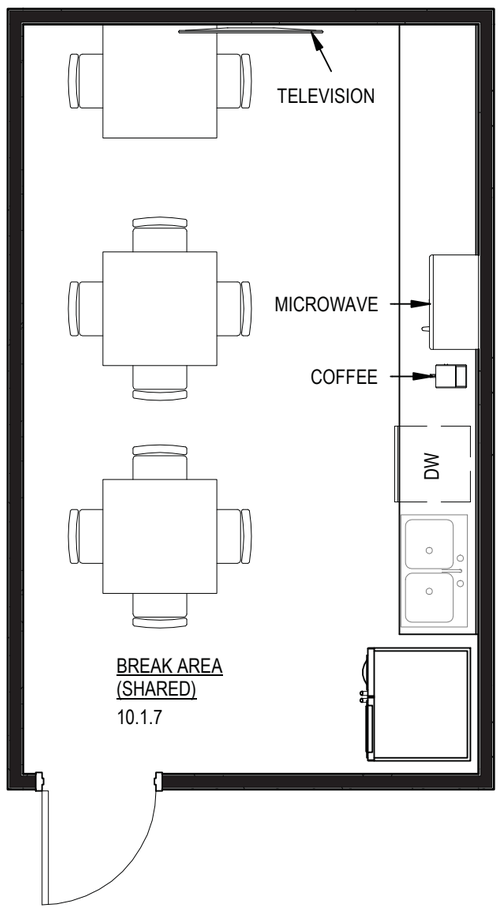
BUILDING SUPPORT

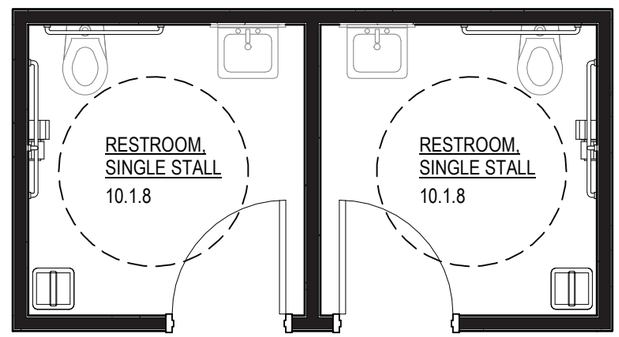
TOOL WORKROOM

900 NSF
Quantity: 1
900 NSF Total



BUILDING SUPPORT





SHARED BREAK AREA

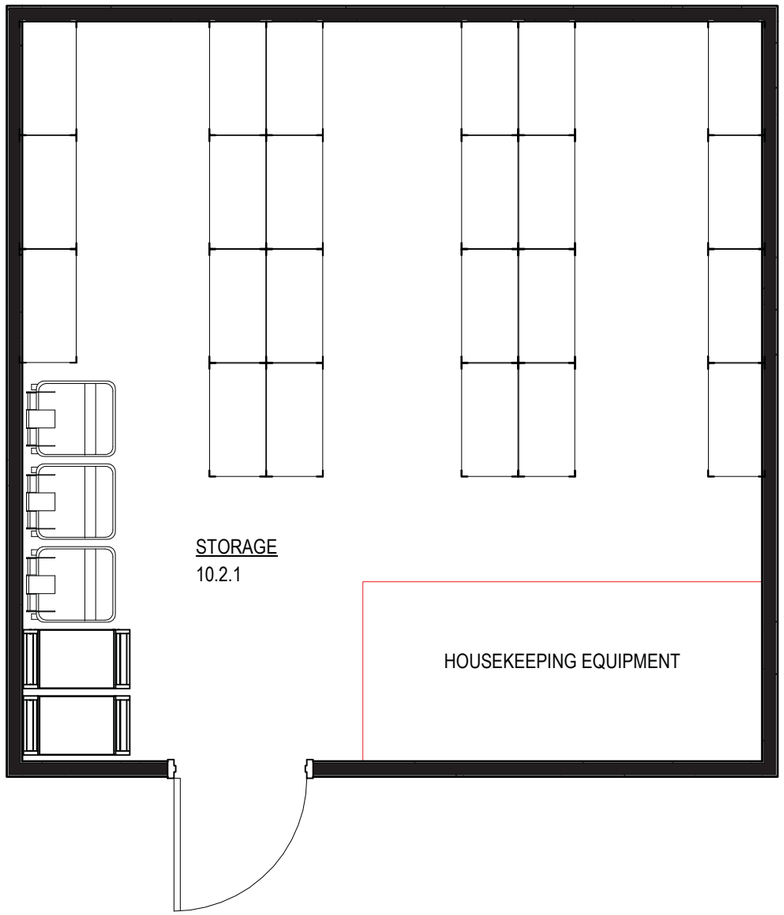
25 NSF
Quantity: 10
250 NSF Total
Capacity: 10
25 NSF / Occupant

SINGLE STALL RESTROOM

75 NSF
Quantity: 2
150 NSF Total

BUILDING SUPPORT

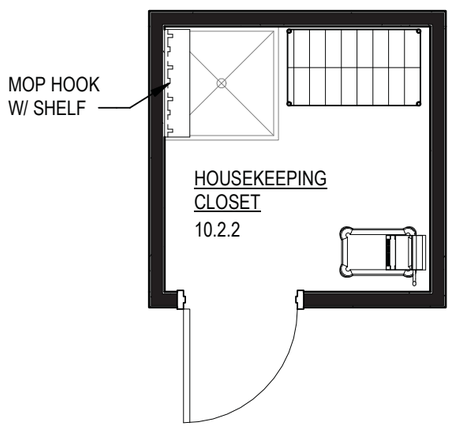
STORAGE
400 NSF
Quantity: 1
400 NSF Total

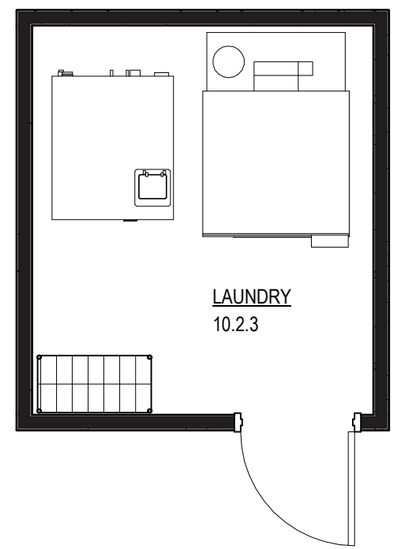


BUILDING SUPPORT

HOUSEKEEPING CLOSET
50 NSF
Quantity: 3
150 NSF Total

LAUNDRY
100 NSF
Quantity: 1
100 NSF Total

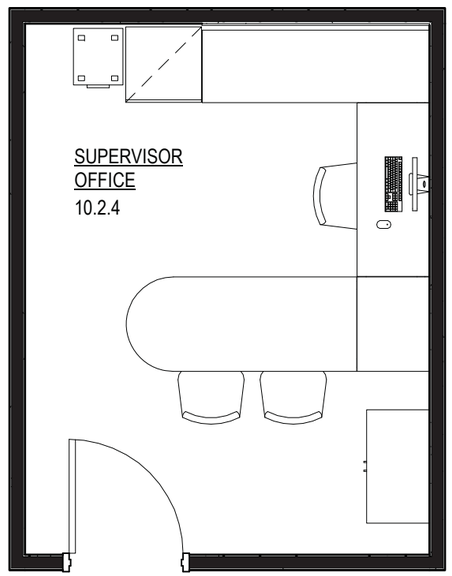


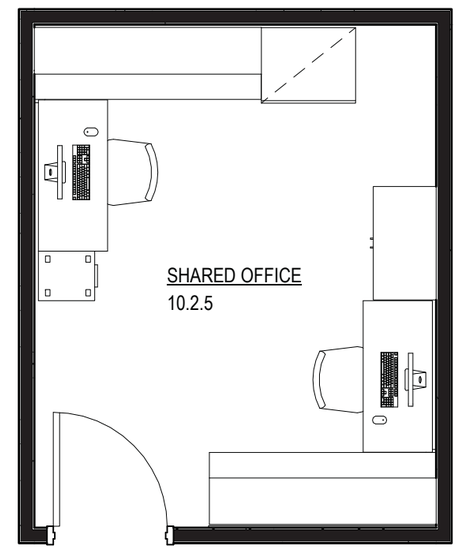


BUILDING SUPPORT

SUPERVISOR OFFICE
160 NSF
Quantity: 1
160 NSF Total

SHARED OFFICE
75 NSF
Quantity: 2
150 NSF Total





MECHANICAL NARRATIVE

SITES: **SW 11TH STREET & SW TOPEKA BOULEVARD**
SW 21ST STREET & SW RANDOLPH AVENUE

General Requirements

The mechanical design for this project will include the following:
- Air handling systems
- Exhaust systems
- Airside energy recovery systems
- Supply and exhaust air distribution systems
- Chilled and heating water generation systems
- Energy management and control system (EMCS)
- Plumbing systems
- Fire suppression systems

The design and installation of all mechanical systems will be in accordance with relevant portions of the following codes, standards, and publications:
- National Institutes of Health (NIH) Design Requirements Manual, 2016 edition
- CDC/NIH Biosafety in Microbiological and Biomedical Laboratories (BMBL), 5th Edition
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  - International Mechanical Code (IMC), 2018 Edition
  - International Plumbing Code (IPC), 2018 Edition
  - International Fuel Gas Code (IFGC), 2018 Edition
  - International Energy Conservation Code (IECC), 2018 Edition
- National Fire Protection Association (NFPA) Codes
- Americans with Disabilities Act Accessibility Guidelines (ADAAG)
- All codes and standards as established by the State of KS

The following temperature, ventilation, and noise parameters will be used as the basis for the design of the building HVAC systems:
- Outdoor Design Conditions:
  - Winter Dry Bulb Temperature: 3.5 Deg. F*
  - Summer Dry Bulb Temperature: 99 Deg. F*
  - Summer Coincident Wet Bulb Temp: 76 Deg. F*
- Indoor Design Conditions:
  - Winter Dry Bulb Temperature:
    - Laboratory areas: 70 +/- 2 Deg. F
    - Laboratory support areas: 70 +/- 2 Deg. F
    - Office/general use areas: 70 +/- 2 Deg. F
    - Mechanical areas: 60 Deg. F
    - All other areas: 70 +/- 2 Deg. F
  - Summer Dry Bulb Temperature:
    - Laboratory areas: 73 +/- 2 Deg. F
    - Laboratory support areas: 73 +/- 2 Deg. F
    - Office/general use areas: 75 +/- 2 Deg. F
    - Mechanical areas: 85 Deg. F
    - All other areas: 75 Deg. F
  - Summer/Winter Relative Humidity:
    - Laboratories – Summer: 50% +/- 5% RH
    - Laboratories – Summer: 30% +/- 5% RH
    - All other areas: 30-60% RH
- Minimum Ventilation Rates:
  - Laboratories (Occupied): 6 ACH
  - Laboratories (Unoccupied): 4 ACH
  - Laboratory support areas: per ASHRAE req.
  - Office/general use areas: per ASHRAE req.
  - Mechanical areas: per ASHRAE req.
  - All other areas: per ASHRAE req.

* Values are based on design conditions for Forbes Field as listed in the 2017 ASHRAE Fundamentals Handbook. Section 6.1.7 Design Requirements of the 2018 NIH Design Requirements Manual require the use of 0.4% DB/MCWB temperatures for summer conditions and 99.6% DB temperature for winter conditions. Further discussions with laboratory staff will be required to determine if 1% DB/MCWB values (94.8/75.4 deg F DB/MCWB) should be used to optimize efficiency. LEED requires the use of 1% DB/MCWB values for energy modeling purposes when developing baseline building conditions.

Air Handling Systems

Office/Administrative Spaces –

For the general use areas, recirculating air modular-type air handling unit(s) AHU(s) will be utilized. These will be stacked-type units with an exhaust/relief level installed on top of a supply level to allow for the use of an enthalpy wheel. The exact amount of ventilation air provided to the

AHU will be calculated in order to comply with applicable code requirements. The components of each AHU will generally be as follows (listed in direction of airflow):

Top Level (Exhaust) Components	Comments
• Enthalpy wheel	Enthalpy wheel w/ bypass dampers, and MERV 8 pre-filters
• Exhaust/relief fan section	Plenum fan array with EC motors (N+1 redundancy) and low-leak airfoil dampers

Bottom Level (Supply) Components	Comments
• Air mixing section	Low-leak airfoil dampers
• Angled pre-filter bank	2" deep pleated, MERV 8 filters
• Final filter bank	4" deep cartridge, MERV 13 filters
• Enthalpy wheel	Enthalpy wheel w/ bypass dampers
• Heating coil bank	Heating hot water coils
• Cooling coil bank	Chilled water coils
• Supply fan section	Plenum fan array with EC motors (N+1 redundancy)
• Sound attenuator	As required
• Discharge plenum	Low-leak airfoil dampers

The AHU(s) will operate in a variable air volume (VAV) mode. AHU walls will be double-wall construction with internal rigid foam insulation. Access sections and internal LED lights will be provided for ease of maintenance.

Laboratory Spaces (Non BSL-3) -

100% dedicate air AHU(s) will be provided to serve the BSL-2 laboratory spaces and will be located in the mechanical penthouse space. The AHU will operate in a variable volume (VAV) mode. The components of the new AHU will be as follows (listed in direction of airflow):

Component	Comments
• Outside air section	Low-leak airfoil dampers
• Angled pre-filter bank	2" deep pleated, MERV 8 filters
• Final filter bank	4" deep cartridge, MERV 14 filters
• Heat recovery coil bank	Run-around loop water coils
• Heating coil bank	Heating hot water coils
• Humidifier section	Steam dispersion grid
• Cooling coil bank	Chilled water coils
• Supply fan section	Plenum fan array with EC motors (N+1 redundancy)
• Sound attenuator	As required
• Discharge plenum	Low-leak airfoil dampers

BSL-3 Laboratory Spaces -

100% outside air handling units (AHUs) will be provided to serve the BSL-3 suite and will be located in the new penthouse.

The AHU will operate in a constant volume (CV) mode. The components of each new AHU will be similar to those listed for the BSL-2 AHU. The need for system redundancy as recommended by the NIH DRM will need to be discussed with laboratory staff in future design phases. Outside air will be introduced to all AHUs through an outdoor air plenum in the penthouse.

Exhaust Systems

Laboratory Spaces (Non BSL-3) -

Mixed flow, high plume exhaust fans, sized for N+1 redundancy, will be provided on the roof to serve the new BSL-2 laboratory spaces. The exhaust fans will operate in a constant volume fashion to maintain an effective exhaust plume height. Bypass dampers will be utilized to allow for VAV operation of air terminal units within the building and will be controlled maintain a system static pressure setpoint. VFDs will be provided to allow for soft starting of the fans. In general, exhaust discharge from the building will be located as far as feasible from fresh air intakes. A wind study will need to be conducted in the subsequent design phase to minimize the potential entrainment of contaminated air within the facility and adjacent buildings through fresh air openings.

The radioisotope laboratory fume hood will be connected to a dedicated exhaust duct system provided with filter racks that can accommodate a pre-filter and HEPA filter adjacent to the discharge of the hood.

BSL-3 Laboratory Spaces -

Centrifugal exhaust fans will be provided in the penthouse to serve the new BSL-3 suite in the new west addition. An inline bag-in/bag-out HEPA filter bank, with gas-tight isolation dampers, decontamination ports, and other accessories, will be provided upstream of the new exhaust fans. The exhaust fans will use VFDs to maintain proper airflow as the HEPA filter loads over time. The exhaust fans and AHU serving the BSL-3 suite will be interlocked to prevent the suite from being positively pressurized in the event of an equipment failure. In general, exhaust discharge from the building will be located as far as feasible from fresh air intakes. Bypass dampers may be utilized on the exhaust system to increase the effective plume height if recommended by the wind study.

Airside Energy Recovery Systems

An enthalpy wheel system will be installed in the non-laboratory AHU to transfer both sensible and latent energy between the exhaust/relief and outdoor airstreams. The system will be comprised of a desiccant wheel, variable speed motor, and bypass dampers.

Glycol runaround loop heat recovery systems will be provided to transfer sensible energy between the exhaust air and outside air streams for the two separate laboratory air handling systems. While not as effective as an enthalpy wheel, the use of this systems eliminates the potential for cross contamination between the two air streams. For the BSL-3 systems, the exhaust air coil banks will be located downstream of the HEPA filters, but upstream of the exhaust fans. For the BSL-2 systems, the exhaust air coil banks will be located downstream of MERV 8 filters, but upstream of the exhaust fans. All heat recovery system components will be located in the new penthouse.

Supply and Exhaust Air Distribution Systems

Office/Administrative Spaces -

A variable volume (VAV) supply air distribution system will be utilized to maintain proper temperature and ventilation control. Each control zone will be served by a supply VAV box with an integral reheat coil. The VAV box will modulate its damper position to maintain the required airflow (for code-required ventilation airflow and temperature control) as system pressure fluctuates. Upon a call for heat, a heating water 2-way control valve willmodulate water flow to the reheat coil to maintain desired zone temperature conditions. All supply ductwork will be of galvanized-construction and shall be insulated to comply with the energy code.

The return air system will generally consist of transfer ducts and return air plenum. Return air airflow-measuring dampers will be used near the return air duct main to control the air volume for each floor. All supply ductwork will be of galvanized-construction.

Wall-mounted carbon dioxide (CO2) sensors will be provided in densely occupied spaces to increase supply airflow when CO2 levels exceed optimum conditions.

Laboratory Spaces (Non BSL-3) -

A variable air volume (VAV) air distribution system will be utilized for all occupied areas. Each control zone will be served by a supply VAV box with an integral hot water reheat coil, while each laboratory temperature control zone that contains fume hoods will be served by a highspeed air valve and hot water reheat coil. A heating water 2-way control valve will modulate water flow to the reheat coils to maintain desired zone temperature conditions. All supply ductwork will be of galvanized-construction and shall be insulated to comply with the energy code.

The exhaust system will operate in a VAV mode similar to the supply air system. Each laboratory temperature control zone in the will be served by an exhaust VAV box or air valve. The airflow will "track" the airflow of the corresponding zone supply air flow to ensure proper space pressurization is maintained. Where a fume hood is installed, a dedicated hood air valve will be used to provide proper fume hood face velocity and a general exhaust air valve will modulate to provide proper room pressurization and minimum ventilation rates. Exhaust ductwork downstream of a fume hood or supporting equipment with high latent-laden exhaust will be of stainless-steel construction. All other exhaust ductwork will be of galvanized construction.

Canopy hoods and snorkel exhaust arms will be utilized as needed to capture exhaust from equipment.

BSL-3 Laboratory Spaces -

In order to maintain proper pressurization of spaces and temperature control, a constant volume (CV) air distribution system will be utilized. Each control zone will be served by a supply air valve with an integral reheat coil. The air valve will provide required airflow to maintain the room setpoint temperature while simultaneously maintaining proper pressurization relationships.

The exhaust system will operate in a CV mode similar to the supply air system. Each control zone will be served by a corresponding exhaust air valve. The airflow of the exhaust air valve will "track" the airflow of the corresponding supply air valve to guarantee proper space pressurization is maintained. Exposed areas of the exhaust terminals shall be stainless steel or epoxy coated.

The need for gas-tight dampers to facilitate decontamination and laboratory isolation will be determined with laboratory staff in future design phases. If required, all supply air ductwork on the room-side of the gas-tight dampers and all exhaust air ductwork will be welded, gas-tight stainless-steel construction.

High-speed airflow actuators will be used to ensure that proper cascading pressurization is maintained to all spaces. A 0.05" w.g. differential pressure goal will be used for each space. Differential pressure monitors will be provided at each room in the BSL-3 suite.

A stainless-steel canopy hood will be provided on the dirty side of the autoclaves to provide capture of moist air released from the chamber. The dirty side canopy exhaust will be tied in to the containment exhaust system.

Chilled Water System

A combination of high-efficiency and heat recovery chillers will be installed in the basement mechanical room along with variable-speed chilled water pumps. The chilled water system will be configured in a variable-primary configuration. Heat rejected into the heat recovery condenser bundle will be usedto satisfy the heating demand of the building. An air separator and expansion tank will be installed as part of the system. The chillers and pumps will be sized for N+1 redundancy. New chilled water piping will be routed to chilled water coil in the AHUs and fan coil units. All chilled water control valves will be pressure-independent type.

Condenser Water Systems

Cooling towers will be installed on grade or on the roof along with any required screening. New condenser water pumps, solids separators, and a drain down tank (as required) will be installed in the basement mechanical room. VFDs will be provided for all cooling tower fans and condenser water pumps. The cooling tower and pumps will be sized for N+1 redundancy.

Heating Water System

Gas-fired, high-efficiency, condensing boilers will be installed in the basement mechanical room to generate heating water for the air handling units, air terminal unit reheat coils, and unitary heaters. The heating water system will be a variable primary configuration. Variable-speed pumps will circulate heating water through the building and through the boilers and shall utilize a bypass valve to ensure minimum flows through boilers are maintained. In addition to the boilers and pumps, an expansion tank, glycol feeder, chemical pot feeder, and air separator will be part of the heating water system and housed within the mechanical room. All coil loads will be provided with pressure-independent 2-way control valves. A 30% glycol solution be used in the heating water system. A heat exchanger and pumps shall be used to provide the reheat/perimeter heat system with heating water to minimize the amount of glycol in the building to just the outside air coils. All boilers and pumps shall be sized for N+1 redundancy. An outdoor air-based reset schedule will be utilized for energy saving purposes with the condensing boilers.

Energy Management Control System

A new building automation system (BMS) will be installed to

serve the new building. The new system and will utilize direct digital controls (DDC) for control, alarming, and energy management purposes. The new system will utilize a BACnet networking protocol compliant with ANSI/ASHRAE standard 135-2016.

Plumbing Systems

Storm Systems:
New separate primary and overflow storm systems will be installed for the new facility. The primary system will route to the city main via below-grade piping. The overflow system will discharge above grade using downspout nozzles (i.e. lamb's tongues) in accordance with code requirements.

Sanitary / Laboratory Drainage and Venting Systems:
A new sanitary waste main will be extended from a sanitary sewer main to support the new facility. The waste mains will be routed throughout the facility and will include a cast iron system for domestic waste and a polypropylene/PVDF system for the laboratory waste. A neutralization basin will be installed outside the building to pretreat the laboratory waste prior to being manifolded in with the domestic waste and discharged into the city main.

Domestic Water Systems:
A new water service will be routed to the building from a city water main in close proximity of the project site. A new water meter and backflow preventer(s) will be installed in the basement mechanical room. An analysis of the incoming water pressure and a water pressure flow test will need to be completed in the subsequent design phase to verify all sizes and the need for a domestic water booster pump.

High-efficiency water heater(s) will be installed in the basement mechanical room to support the domestic hot water load from the restrooms, kitchen, and janitor closet. A recirculating pump and piping will be installed on the domestic hot water system to ensure continuous hot water supply at each point of use.

A new water softener will be installed in the basement mechanical room. Soft water will be used as the feed water for water heaters and the AHU humidifier. It will also be extended to laboratory equipment as necessary.

A new thermal mixing valve and recirculating pump will be installed to support a tepid water system that will be used for emergency fixtures (i.e. safety showers, eye washes) in the laboratory spaces.

Reduced-pressure backflow preventers will be installed as necessary to meet code requirements for isolated, higher-risk systems. Examples include feeds to HVAC system makeup and site irrigation.

Laboratory Water Systems:
Reduced pressure zone assembly type backflow preventers will be installed in the basement mechanical room to isolate and protect the domestic water system from the laboratory cold and hot water systems. A new high-efficiency laboratory water heater will be installed in the mechanical room to support the laboratory hot water demand. A recirculating pump and piping will be installed on the laboratory hot water system to ensure continuous hot water supply at each point of use. Hot and cold laboratory water will be piped to all laboratory fixtures and equipment; including laboratory sinks and process equipment. Foot pedals will be utilized at laboratory sinks to allow for hands-free operation. Vacuum breakers will be installed at all laboratory sinks.

A new high purity water system (DI) will be installed in the basement mechanical room. Type 2 (1 megaohm) water will be circulated through the building to all laboratories requiring high purity water at water faucets and other point of use outlets. The pure water system will be designed with features to minimize bacterial colonization. Features shall include but not be limited to the use of UV light and submicron filters. Circulated water will be kept at a temperature under 85 deg F. Ultrapure water polishers will be located throughout the laboratory areas to generate Type 1 (18 megaohm) water.

Natural gas:
Natural gas will be brought to the building for the heating plant and for laboratory gas usage. The laboratory gas will be reduced in pressure to less than 14" w.c.

Specialty Gas Systems:
Laboratory Vacuum: A medical grade vacuum system will be provided for the laboratory spaces in the building. The pump will be located in the basement mechanical room. An oil sealed medical grade vacuum pump will be used.

Laboratory Compressed Air: A laboratory compressed air system will be provided for the building. The laboratory compressed air pump will be in the basement of the mechanical room.

Bulk Gases: Bulk gases including Argon and Liquid Nitrogen will be mounted on an exterior concrete pad and piped into the building for laboratory use. Liquid nitrogen system will include vacuum insulated stainless steel piping to service/filler port. Port shall be located to allow for bulk refilling from bulk supply tanker. Vacuum insulated piping and manifold to interior dewar filling stations throughout facility.

Other Specialty Gases: Gas cylinders shall be housed in cylinder storage rooms adjacent to Customer Service. Piping from gas cylinder racks to point of use will be provided. Piping, valve outlets, and connections shall be of type and material suitable for the specified gas. Manifolds shall include provision for two cylinders connected to the piped system at any one time, with valving to allow cut over between cylinders, and replacement of one cylinder without deactivating the system.

Fire Suppression Systems

A new NFPA 13 compliant wet-pipe sprinkler system will provide full coverage for the facility. Quick-response sprinklers will be used throughout the facility. High temperature sprinklers shall be used in autoclave areas, mechanical/electrical/IT rooms, and any other areas in which high temperatures are routinely experienced. Control valves will be located on each floor.

Water supply for the system will be provided by extending a new fire main to the project site. Exact location of the existing water main will be identified in the subsequent design phases. A UL listed, FM-approved backflow preventer meeting the requirements of ASSE 1048 will be installed downstream of the post indicator valve. Offices will be classified as light hazard. All laboratory work areas will be classified as Ordinary Hazard Group 2. Storage rooms, custodial closets, and mechanical rooms will be classified as Ordinary Hazard, Group 1 or Group 2, depending on specific requirements. Special hazard areas requiring higher hazard classifications shall be protected in accordance with NFPA 13. Code-required fire dampers, smoke dampers, and fire/smoke dampers will be installed as necessary.

A standpipe system will be required for this building to achieve the 100 psig required at the roof per NFPA 14. Hose outlets will be provided at the intermediate landings of all required interior exit stairways. The need for a new fire pump and jockey pump will be determined in the subsequent design phase.

Design of the fire protection systems is subject to review by the Authority Having Jurisdiction (AHJ) and may require modifications in subsequent design phases, specifically but not limited to the location of the fire department connection.

BSL-3 Containment Laboratory Requirements

All HVAC and piping penetrations into the BSL-3 containment areas will be sealed to maintain the integrity of the environment. All penetration seals will be gasand watertight. All ductwork located within the BSL-3 containment zone shall be fully welded and gas-tight.

Sustainability Considerations

The following mechanical and plumbing strategies shall be considered for inclusion in this project that help with the conservation of energy and water and optimize the indoor environment:

- Variable speed drives or electronically commutated motors for air handling and water handling equipment throughout
- Premium efficiency motors throughout
- Variable air volume laboratory systems
- Low flow variable air volume fume hoods
- CO2 monitoring of high-density occupant spaces
- Energy recovery system – glycol run around to precondition outside air
- Energy recovery system – enthalpy wheel to precondition outside air
- Energy recovery system – heat recovery chiller to use waste heat for building heating
- Low flow plumbing fixtures (1.28 gpf water closets, 0.125 gpf urinals)
- Low pressure drop air handling systems
- 3rd party wind tunnel testing of building for optimizing air intakes versus contaminated air sources
- Temperature controls for occupants
- Perimeter heating in conjunction with warmer discharge air temperature in lieu of reheating cold air
- Point of use cooling in lieu of exhausting conditioned air for internal heat load dominant lab and equipment spaces

SITE: SE 70TH STREET & SE D STREET (FORBES FIELD)

General Requirements

The mechanical design for this project will include the following:
- Air handling systems
- Exhaust systems
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- Chilled and heating water generation systems
- Energy management and control system (EMCS)
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    - Laboratory support areas: 70 +/- 2 Deg. F
    - Office/general use areas: 70 +/- 2 Deg. F
    - Mechanical areas: 60 Deg. F
    - All other areas: 70 +/- 2 Deg. F
  - Summer Dry Bulb Temperature:
    - Laboratory areas: 73 +/- 2 Deg. F
    - Laboratory support areas: 73 +/- 2 Deg. F
    - Office/general use areas: 75 +/- 2 Deg. F

- Mechanical areas: 85 Deg. F
    - All other areas: 75 Deg. F
- Summer/Winter Relative Humidity:
    - Laboratories – Summer: 50% +/- 5% RH
    - Laboratories – Summer: 30% +/- 5% RH
    - All other areas: 30-60% RH
- Minimum Ventilation Rates:
    - Laboratories (Occupied): 6 ACH
    - Laboratories (Unoccupied): 4 ACH
    - Laboratory support areas: per ASHRAE req.
    - Office/general use areas: per ASHRAE req.
    - Mechanical areas: per ASHRAE req.
    - All other areas: per ASHRAE req.

* Values are based on design conditions for Forbes Field as listed in the 2017 ASHRAE Fundamentals Handbook. Section 6.1.7 Design Requirements of the 2018 NIH Design Requirements Manual require the use of 0.4% DB/MCWB temperatures for summer conditions and 99.6% DB temperature for winter conditions. Further discussions with laboratory staff will be required to determine if 1% DB/MCWB values (94.8/75.4 deg F DB/MCWB) should be used to optimize efficiency. LEED requires the use of 1% DB/MCWB values for energy modeling purposes when developing baseline building conditions.

Air Handling Systems

Office/Administrative Spaces –

For the general use areas, recirculating air modular-type air handling unit(s) AHU(s) will be utilized. These will be stacked-type units with an exhaust/relief level installed on top of a supply level to allow for the use of an enthalpy wheel. The exact amount of ventilation air provided to the AHU will be calculated in order to comply with applicable code requirements. The components of each AHU will generally be as follows (listed in direction of airflow):

Top Level (Exhaust) Components	Comments
• Enthalpy wheel	Enthalpy wheel w/ bypass dampers, and MERV 8 pre-filters
• Exhaust/relief fan section	Plenum fan array with EC motors (N+1 redundancy) and low-leak airfoil dampers

Bottom Level (Supply) Components	Comments
• Air mixing section	Low-leak airfoil dampers
• Angled pre-filter bank	2" deep pleated, MERV 8 filters
• Final filter bank	4" deep cartridge, MERV 13 filters
• Enthalpy wheel	Enthalpy wheel w/ bypass dampers
• Heating coil bank	Heating hot water coils
• Cooling coil bank	Chilled water coils
• Supply fan section	Plenum fan array with EC motors (N+1 redundancy)
• Sound attenuator	As required
• Discharge plenum	Low-leak airfoil dampers

The AHU(s) will operate in a variable air volume (VAV) mode. AHU walls will be double-wall construction with internal rigid foam insulation. Access sections and internal LED lights will be provided for ease of maintenance.

Laboratory Spaces (Non BSL-3) -

100% dedicate air AHU(s) will be provided to serve the BSL-2 laboratory spaces and will be located in the mechanical penthouse space. The AHU will operate in a variable volume (VAV) mode. The components of the new AHU will be as follows (listed in direction of airflow):

Component	Comments
• Outside air section	Low-leak airfoil dampers
• Angled pre-filter bank	2" deep pleated, MERV 8 filters
• Final filter bank	4" deep cartridge, MERV 14 filters
• Heat recovery coil bank	Run-around loop water coils
• Heating coil bank	Heating hot water coils
• Humidifier section	Steam dispersion grid
• Cooling coil bank	Chilled water coils
• Supply fan section	Plenum fan array with EC motors (N+1
	redundancy)
• Sound attenuator	As required
• Discharge plenum	Low-leak airfoil dampers

SL-3 Laboratory Spaces -

100% outside air handling units (AHUs) will be provided to serve the BSL-3 suite and will be located in the new penthouse. The AHU will operate in a constant volume (CV) mode. The components of each new AHU will be similar to those listed for the BSL-2 AHU. The need for system redundancy as recommended by the NIH DRM will need to be discussed with laboratory staff in future design phases.

Outside air will be introduced to all AHUs through an outdoor air plenum in the penthouse.

Exhaust Systems

Laboratory Spaces (Non BSL-3) -

Mixed flow, high plume exhaust fans, sized for N+1 redundancy, will be provided on the roof to serve the new BSL-2 laboratory spaces. The exhaust fans will operate in a constant volume fashion to maintain an effective exhaust plume height. Bypass damperswill be utilized to allow for VAV operation of air terminal units within the building and will be controlled maintain a system static pressure setpoint. VFDs will be provided to allow for soft starting of the fans. In general, exhaust discharge from the building will be located as far as feasible from fresh air intakes. A wind study will need to be conducted in the subsequent design phase to minimize the potential entrainment of contaminated air within the facility and adjacent buildings through fresh air openings.

The radioisotope laboratory fume hood will be connected to a dedicated exhaust duct system provided with filter racks that can accommodate a pre-filter and HEPA filter adjacent to the discharge of the hood.

BSL-3 Laboratory Spaces -

Centrifugal exhaust fans will be provided in the penthouse to serve the new BSL-3 suite in the new west addition. An inline bag-in/bag-out HEPA filter bank, with gas-tight isolation dampers, decontamination ports, and other accessories, will be provided upstream of the new exhaust fans. The exhaust fans will use VFDs to maintain proper airflow as the HEPA filter loads over time. The exhaust fans and AHU serving the BSL-3 suite will be interlocked to prevent the suite from being positively pressurized in the event of an equipment failure. In general, exhaust discharge from the building will be located as far as feasible from fresh air intakes. Bypass dampers may be utilized on the exhaust system to increase

the effective plume height if recommended by the wind study.

Airside Energy Recovery Systems

An enthalpy wheel system will be installed in the non-laboratory AHU to transfer both sensible and latent energy between the exhaust/relief and outdoor airstreams. The system will be comprised of a desiccant wheel, variable speed motor, and bypass dampers.

Glycol runaround loop heat recovery systems will be provided to transfer sensible energy between the exhaust air and outside air streams for the two separate laboratory air handling systems. While not as effective as an enthalpy wheel, the use of this systems eliminates the potential for cross contamination between the two air streams. For the BSL-3 systems, the exhaust air coil banks will be located downstream of the HEPA filters, but upstream of the exhaust fans. For the BSL-2 systems, the exhaust air coil banks will be located downstream of MERV 8 filters, but upstream of the exhaust fans. All heat recovery system components will be located in the new penthouse.

Supply and Exhaust Air Distribution Systems

Office/Administrative Spaces -

A variable volume (VAV) supply air distribution system will be utilized to maintain proper temperature and ventilation control. Each control zone will be served by a supply VAV box with an integral reheat coil. The VAV box will modulate its damper position to maintain the required airflow (for code-required ventilation airflow and temperature control) as system pressure fluctuates. Upon a call for heat, a heating water 2-way control valve will modulate water flow to the reheat coil to maintain desired zone temperature conditions. All supply ductwork will be of galvanized-construction and shall be insulated to comply with the energy code.

The return air system will generally consist of transfer ducts and return air plenum. Return air airflow-measuring dampers will be used near the return air duct main to control the air volume for each floor. All supply ductwork will be of galvanized-construction.

Wall-mounted carbon dioxide (CO2) sensors will be provided in densely occupied spaces to increase supply airflow when CO2 levels exceed optimum conditions.

Laboratory Spaces (Non BSL-3) -

A variable air volume (VAV) air distribution system will be utilized for all occupied areas. Each control zone will be served by a supply VAV box with an integral hot water reheat coil, while each laboratory temperature control zone that contains fume hoods will be served by a highspeed air valve and hot water reheat coil. A heating water 2-way control valve will modulate water flow to the reheat coils to maintain desired zone temperature conditions. All supply ductwork will be of galvanized-construction and shall be insulated to comply with the energy code.

The exhaust system will operate in a VAV mode similar to the supply air system. Each laboratory temperature control zone in the will be served by an exhaust VAV box or air valve. The airflow will "track" the airflow of the corresponding zone supply air flow to ensure proper space pressurization is maintained. Where a fume hood is installed, a dedicated hood air valve will be used to provide proper fume hood face velocity and a general exhaust air valve will modulate to provide proper room pressurization and minimum ventilation rates. Exhaust ductwork downstream of a fume hood or supporting equipment with high latent-laden exhaust will be of stainless-steel construction. All other exhaust ductwork will be of galvanized construction. Canopy hoods and snorkel exhaust arms will be utilized as needed to capture exhaust from equipment.

BSL-3 Laboratory Spaces -

In order to maintain proper pressurization of spaces and temperature control, a constant volume (CV) air distribution system will be utilized. Each control zone will be served by a supply air valve with an integral reheat coil. The air valve will provide required airflow to maintain the room setpoint temperature while simultaneously maintaining proper pressurization relationships.

The exhaust system will operate in a CV mode similar to the supply air system. Each control zone will be served by a corresponding exhaust air valve. The airflow of the exhaust air valve will "track" the airflow of the corresponding supply air valve to guarantee proper space pressurization is maintained. Exposed areas of the exhaust terminals shall be stainless steel or epoxy coated.

The need for gas-tight dampers to facilitate decontamination and laboratory isolation will be determined with laboratory staff in future design phases. If required, all supply air ductwork on the room-side of the gas-tight dampers and all exhaust air ductwork will be welded, gas-tight stainless-steel construction.

High-speed airflow actuators will be used to ensure that proper cascading pressurization is maintained to all spaces. A 0.05" w.g. differential pressure goal will be used for each space. Differential pressure monitors will be provided at each room in the BSL-3 suite.

A stainless-steel canopy hood will be provided on the dirty side of the autoclaves to provide capture of moist air released from the chamber. The dirty side canopy exhaust will be tied in to the containment exhaust system.

Chilled Water System

The existing facility is served by (2) 400-ton York chillers in a standalone central utility plant that is connected to the main building via a walkable utility tunnel. Initial analysis shows that there is not adequate capacity in the existing plant to support the anticipated loads of the proposed facility. In addition to this, the chillers appear to be pushing beyond their expected service life. Further conversations with staff will be required to determine if new chiller should be installed

in the basement mechanical room of the new facility or if capacity should be added to the existing plant.

If capacity is added to the plant, then chilled water piping will be routed through a new utility tunnel that connects the new facility to the existing central utility plant. Within the new facility, new chilled water piping will be routed to chilled water coil in the AHUs and fan coil units. All chilled water control valves will be pressure-independent type. Space will need to be identified to accommodate (2) new chillers and pumps to provide N+1 redundancy to the system. The condenser water system capacity will also need to be evaluated to determine if additional cooling towers and pumps will need to be added to support the increased load of the new facility. After the occupants have been moved over to the new facility, the mains serving the old building will be demolished along with the associated utility tunnel. If a new chilled and condenser water system is installed in the new facility, then a combination of high-efficiency and heat recovery chillers will be installed in the basement mechanical room along with variable-speed chilled water pumps. The chilled water system will be configured in a variable-primary configuration. Heat rejected into the heat recovery condenser bundle will be used to satisfy the heating demand of the building. An air separator and expansion tank will be installed as part of the system. The chillers and pumps will be sized for N+1 redundancy. New chilled water piping will be routed to chilled water coil in the AHUs and fan coil units. All chilled water control valves will be pressure-independent type. Cooling towers will be installed on grade or on the roof along with any required screening. New condenser water pumps, solids separators, and a drain down tank (as required) will be installed in the basement mechanical room. VFDs will be provided for all cooling tower fans and condenser water pumps. The cooling tower and pumps will be sized for N+1 redundancy.

Steam and Heating Water Systems

The existing facility is served by (2) 8,400 MBH Superior boilers in a standalone central utility plant that is connected to the main building via a walkable utility tunnel. Initial analysis appears to show the system is of sufficient capacity to support the new facility. New steam and steam condensate mains will be routed between the central plant and the basement mechanical room of the new facility via a new utility tunnel as noted in the Chilled Water System section above. A new steam PRV will be installed to reduce the pressure of the steam that will then be used to feed new shell and tube heat exchangers sized for N+1 redundancy. Two sets of heat exchangers will be used to transfer heat into separate heating hot water loops; one with glycol for air handling unit coils and the other without glycol that will be used for reheat coils and perimeter heaters. Variable-speed pumps will circulate heating water through the building. In addition to the heat exchangers and pumps, expansion tanks, glycol feeders, chemical pot feeders, and air separators will be part of the heating water systems and housed within the mechanical room. All coil loads will be provided with pressure-independent 2-way control valves.

The (2) existing high-pressure steam boilers in the central utility plant will be re-used to support the steam needs of autoclaves, sterilizers, and other laboratory equipment. Steam and steam condensate piping will be routed through the utility tunnel to the basement mechanical room and routed to equipment throughout the facility.

Energy Management Control System

A new building automation system (BMS) will be installed to serve the new building. The new system and will utilize direct digital controls (DDC) for control, alarming, and energy management purposes. The new system will utilize a BACnet networking protocol compliant with ANSI/ASHRAE standard 135-2016.

Plumbing Systems

Storm Systems

New separate primary and overflow storm systems will be installed for the new facility. The primary system will route tothe city main via below-grade piping. The overflow system will discharge above grade using downspout nozzles (i.e. lamb's tongues) in accordance with code requirements.

Sanitary / Laboratory Drainage and Venting Systems

A new sanitary waste main will be extended from a sanitary sewer main to support the new facility. The waste mains will be routed throughout the facility and will include a cast iron system for domestic waste and a polypropylene/ PVDF system for the laboratory waste. A neutralization basin will be installed outside the building to pretreat the laboratory waste prior to being manifolded in with the domestic waste and discharged into the city main.

Domestic Water Systems

A new water service will be routed to the building from a city water main in close proximity of the project site. A new water meter and backflow preventer(s) will be installed in the basement mechanical room. An analysis of the incoming water pressure and a water pressure flow test will need to be completed in the subsequent design phase to verify all sizes and the need for a domestic water booster pump, however it is not presumed that this will be required based on the fact that the existing facility is of similar height and does not require a booster pump.

High-efficiency water heater(s) will be installed in the basement mechanical room to support the domestic hot water load from the restrooms, kitchen, and janitor closet. A recirculating pump and piping will be installed on the domestic hot water system to ensure continuous hot water supply at each point of use.

A new water softener will be installed in the basement mechanical room. Soft water will be used as the feed water for water heaters and the AHU humidifier. It will also be extended to laboratory equipment as necessary.

A new thermal mixing valve and recirculating pump will be installed to support a tepid water system that will be used for emergency fixtures (i.e. safety showers, eye washes) in the laboratory spaces.

Reduced-pressure backflow preventers will be installed as necessary to meet code requirements for isolated, higher-risk systems. Examples include feeds to HVAC system makeup and site irrigation.

Laboratory Water Systems

Reduced pressure zone assembly type backflow preventers will be installed in the basement mechanical room to isolate and protect the domestic water system from the laboratory cold and hot water systems. A new high-efficiency laboratory water heater will be installed in the mechanical room to support the laboratory hot water demand. A recirculating pump and piping will be installed on the laboratory hot water system to ensure continuous hot water supply at each point of use. Hot and cold laboratory water will be piped to all laboratory fixtures and equipment; including laboratory sinks and process equipment. Foot pedals will be utilized at laboratory sinks to allow for hands-free operation. Vacuum breakers will be installed at all laboratory sinks.

A new high purity water system (DI) will be installed in the basement mechanical room. Type 2 (1 megaohm) water will be circulated through the building to all laboratories requiring high purity water at water faucets and other point of use outlets. The pure water system will be designed with features to minimize bacterial colonization. Features shall include but not be limited to the use of UV light and submicron filters. Circulated water will be kept at a temperature under 85 deg F. Ultrapure water polishers will be located throughout the laboratory areas to generate Type 1 (18 megaohm) water.

Natural Gas

Natural gas will be brought to the building for the heating plant and for laboratory gas usage. The laboratory gas will be reduced in pressure to less than 14" w.c.

Specialty Gas Systems

Laboratory Vacuum: A medical grade vacuum system will be provided for the laboratory spaces in the building. The pump will be located in the basement mechanical room. An oil sealed medical grade vacuum pump will be used.

Laboratory Compressed Air: A laboratory compressed air system will be provided for the building. The laboratory compressed air pump will be located in the basement.

Bulk Gases: Bulk gases including Argon and Liquid Nitrogen will be mounted on an exterior concrete pad and piped into the building for laboratory use. Liquid nitrogen system will include vacuum insulated stainless steel piping to service/filler port. Port shall be located to allow for bulk refilling from bulk supply tanker. Vacuum insulated piping and
manifold to interior dewar filling stations throughout facility. Other Specialty Gases: Gas cylinders shall be housed in cylinder storage rooms adjacent to Customer Service. Piping from gas cylinder racks to point of use will be provided. Piping, valve outlets, and connections shall be of type and material suitable for the specified gas. Manifolds shall include provision for two cylinders connected to the piped system at any one time, with valving to allow cut over between cylinders, and replacement of one cylinder without deactivating the system.

Fire Suppression Systems

A new NFPA 13 compliant wet-pipe sprinkler system will provide full coverage for the facility. Quick-response sprinklers will be used throughout the facility. High temperature sprinklers shall be used in autoclave areas, mechanical/electrical/IT rooms, and any other areas in which high temperatures are routinely experienced. Control valves will be located on each floor.

Water supply for the system will be provided by extending a new fire main to the project site. Exact location of the existing water main will be identified in the subsequent design phases. A UL listed, FM-approved backflow preventer meeting the requirements of ASSE 1048 will be installed downstream of the post indicator valve. Offices will be classified as light hazard. All laboratory work areas will be classified as Ordinary Hazard Group 2. Storage rooms, custodial closets, and mechanical rooms will be classified as Ordinary Hazard, Group 1 or Group 2, depending on specific requirements. Special hazard areas requiring higher hazard classifications shall be protected in accordance with NFPA 13. Code-required fire dampers, smoke dampers, and fire/smoke dampers will be installed as necessary.

A standpipe system will be required for this building to achieve the 100 psig required at the roof per NFPA 14. Hose outlets will be provided at the intermediate landings of all required interior exit stairways. The need for a new fire pump and jockey pump will be determined in the subsequent design phase.

Design of the fire protection systems is subject to review by the Authority Having Jurisdiction (AHJ) and may require modifications in subsequent design phases, specifically but not limited to the location of the fire department connection.

BSL-3 Containment Laboratory Requirements

All HVAC and piping penetrations into the BSL-3 containment areas will be sealed to maintain the integrity of the environment. All penetration seals will be gas and watertight. All ductwork located within the BSL-3 containment zone shall be fully welded and gas-tight.

Sustainability Considerations

The following mechanical and plumbing strategies shall be considered for inclusion in this project that help with the conservation of energy and water and optimize the indoor environment:

- Variable speed drives or electronically commutated motors for air handling and water handling equipment throughout
- Premium efficiency motors throughout
- Variable air volume laboratory systems
- Low flow variable air volume fume hoods
- CO2 monitoring of high-density occupant spaces.
- Energy recovery system – glycol run around to precondition outside air
- Energy recovery system – enthalpy wheel to precondition outside air
- Energy recovery system – heat recovery chiller to use waste heat for building heating
- Low flow plumbing fixtures (1.28 gpf water closets, 0.125 gpf urinals)
- Low pressure drop air handling systems
- 3rd party wind tunnel testing of building for optimizing air intakes versus contaminated air sources
- Temperature controls for occupants
- Perimeter heating in conjunction with warmer discharge air temperature in lieu of reheating cold air
- Point of use cooling in lieu of exhausting conditioned air for internal heat load dominant lab and equipment spaces

ELECTRICAL NARRATIVE

General Requirements

The electrical design for this project will include the following:
- Primary electrical service to the facility
- Electrical distribution systems throughout the facility
- LED Lighting systems throughout the facility and site
- A pad-mounted, diesel driven standby generator system to supply back-up power to life safety, legally required, and optional standby loads throughout the new facility
- A central Uninterruptible power supply (UPS) system and associated electrical distribution
- Receptacle layouts to support computer/office equipment, laboratory equipment, and any additional general purpose/laboratory needs throughout the facility
- Outlet boxes and raceway distribution systems to support voice and data needs throughout the facility
- Necessary electrical service to HVAC equipment
- Building electrical grounding system
- A complete, master labeled, lightning protection system for connection to existing system
- Electrical rough-ins to support access control systems, video surveillance security systems, audio visual systems and any other special systems
- A digital, addressable fire alarm system, complete with voice evacuation capabilities
- Energy saving technologies will be provided as required in order to meet the applicable adopted energy code. Those technologies will be investigated in order to provide the most cost effective and reliable solution. These technologies include, but may not be limited, to occupancy/vacancy sensors, lighting relay panels, dimming, multi-zone lighting control, plug load controls, and daylight harvesting control systems. Additionally, highly efficient LED fixtures will be used throughout the project in order to not exceed maximum allowable lighting power densities

The design and installation of all electrical systems and devices will be in accordance with relative portions of the following codes, standards, and publications:
- National Electrical Code; NFPA #70
- National Fire Protection Association (NFPA) Standards
- National Electrical Safety Code (NESC)
- The International Building Code (IBC)
- ASHRAE Standards for the design of energy efficient buildings
- International Energy Conservation Code (IECC)
- International Fire Code
- American National Standards Institute (ANSI) Standards
- National Electrical Manufacturer's Association (NEMA) Standards
- Underwriter's Laboratories, Inc. (UL)
- Illuminating Engineering Society (IES) Lighting Handbook
- Americans with Disabilities Act Accessibility Guidelines (ADAAG)
- The National Institutes of Health (NIH) Design Requirements Manual
- CDC/NIH Biosafety in Microbiological and Biomedical Labs

The codes and standards listed above ensure that at a minimum, fire and life safety are provided to occupants of the building. In addition to those noted above, standards established by the Authority Having Jurisdiction (AHJ) and the Kansas Department of Health and Environment will be adhered to for all phases of design, documentation, and construction.

Primary Electrical Service

Primary electrical service to the facility will be fully and completely coordinated with Evergy (Formerly KCP&L and Westar Energy) and their published design/installation standards. All necessary underground conduits to support the installation of primary service cabling to the facility will be provided. Concrete pads will be provided to support the installation of a new pad-mounted service transformer and any required sectionalizer switch(es). The final location for the service transformer will be coordinated with the owner and Evergy and shall be placed as close to the main service entrance electrical room as possible. The secondary voltage for the service transformer will be 480Y/277 volt, 3-phase, 4-wire. Service entrance cabling will be copper and will be routed underground from the service transformer to a single-ended, 480Y/277V volt, 3-phase, 4-wire, 3000A main service switchboard located in the main electrical room.

Electrical Distribution System

The primary electrical distribution system service voltage will be 480Y/277 volt, 3-phase, 4-wire. This service voltage is most appropriate for a facility of this size and type and will reduce electrical losses due to voltage drop in feeders and branch circuits. 480Y/277 volt, 3-phase, 4-wire distribution panels will be provided on each floor in a dedicated, lockable electrical room. Dry type transformers and panelboards will

be provided as required to support the necessary 208Y/120 volt, 3-phase, 4–wire distribution system throughout the facility. In general, HVAC equipment, elevators, and other large equipment loads will be served at 480 volts, 3-phase. LED lighting throughout the facility and on site will be served at 277 volts, single phase. Laboratory, office, and computer equipment, as well as general-purpose receptacle circuits will be served at 120 volts, single phase. All other equipment and devices will be served by the appropriate distribution system voltage.

Additional electrical distribution system details for the new facility include the following:

- Surge Suppression Device (SPD) equipment will be provided for the main service switchboard and all life safety panels
- Distribution system switchboards and panelboards will make use of circuit breakers for overcurrent protection of feeders and branch circuits
- Copper bussing will be provided for all electrical distribution system equipment
- Digital customer metering equipment will be provided at the main service switchboard, at the main distribution panel for each branch of generator power, and at the main distribution panel fed from the UPS system. Digital metering devices will be connected to the building energy management control system to allow for remote monitoring
- Separate panelboards will be used to support facility lighting, general-purpose electrical requirements, and mechanical equipment
- Spare circuit breakers at the main switchboard for future Photovoltaic (PV) System

Additional electrical distribution details will be developed as the design process continues. The electrical distribution system as described above will allow for the following:

- System capacity to accommodate present and future loads.
- Maximum flexibility to accommodate future system mods
- Efficient service to building lighting, equipment and HVAC loads

Emergency/Back-Up Power Systems

A new diesel driven generator set equipped with a weatherproof, sound attenuated enclosure will be provided outside, on the South side of the facility. The system will be used to supply life safety, legally required, and optional standby loads in the new facility. 4-pole automatic transfer switches (with bypass isolation) and emergency/standby distribution panelboards will be provided throughout the facility to serve standby and emergency loads. All main emergency/standby distribution equipment, including the automatic transfer switches, will be installed within a physically separated electrical room from the main (normal power) electrical service equipment. An NEC 700.3(F) compliant generator docking station with NEMA 3R enclosure and integral manual transfer switch will be located on site, adjacent to the new generator.

Additionally, a central Uninterruptible Power Supply (UPS) system will be provided with the main unit being installed in a dedicated UPS room. The UPS shall be provided with a Maintenance Bypass Panel or Switch to allow for continuation of power during required maintenance on the UPS cabinet/ UPS batteries. The UPS system shall be fed from the optional standby branch of the generator system.

Lighting Systems

Lighting systems throughout the facility will be designed in accordance with IES recommendations and applicable energy codes. All spaces, both interior and exterior, will be rendered and light levels calculated utilizing lighting calculation software. Lighting power densities will be minimized by using highly efficient fixtures throughout the facility and site. Occupancy/vacancy sensors will be used throughout many spaces to provide automatic off of lighting loads during unoccupied times. In addition, where daylighting opportunities exist, the use of daylight harvesting control systems will be implemented. An astronomic timeclock-based control system will be investigated for exterior spaces and large volume public spaces within the facility. In general, lighting systems will be as follows:

- Laboratory Lighting:

For laboratories it is critical to provide appropriate illumination levels on bench tops, to minimize the impact of shadows created by equipment, casework and personnel, and to minimize the effects of direct and indirect glare on computer and equipment screens. In addition, it is imperative that labs be provided with lighting fixtures that can withstand environmental conditions in each space. Lighting will be oriented to provide high levels of illuminance on the work surfaces while minimizing shadowing. Fixtures will have wide distribution to provide vertical plane illumination and uniformity. Task lighting will be evaluated and, if deemed appropriate, provided in each laboratory according to direction provided by the users. All fixtures in laboratory areas will be equipped with dimming to provide a variety of light levels. Normal power fixtures in laboratories will be enabled by occupancy/vacancy sensors and controlled locally within each space. A portion of the lighting in all laboratories will be connected to the emergency generator system.

- Main Meeting/Conference Room Lighting:

A multi-scene controller and dimmable LED fixtures arranged for maximum flexibility and controllability of the space will be provided. Vacancy sensors will be provided in order to provide automatic off. When required by the audio/visual needs of the room, additional control outputs from the lighting control system will be provided so as to integrate with other audio/visual controls/touchscreens in the space. Photosensor control of fixtures in daylight zones will be incorporated where applicable.

- Smaller Conference Room/Breakout Space Lighting:

Multiple layers of light shall be investigated with multi-zone control in order to provide maximum flexibility to the space. All light fixtures will be controlled by dual technology vacancy sensors. Photosensor control of fixtures in the daylight zone will be incorporated where applicable. Fixtures will be equipped with 0-10V dimming in order to provide a variety of light levels.

- Office Space Lighting:

All light fixtures will be controlled by dual technology vacancy sensors. Photosensor control of fixtures in the daylight zone will be incorporated where applicable. Fixtures will be equipped with 0-10V dimming in order to provide a variety of light levels.

- Corridor Lighting:

A portion of these fixtures will be fedfrom the life safety branch in order to provide Code required emergency egress lighting and night lighting. Occupancy-based control, timeclock-based control and photosensor controls will all be investigated and applied where appropriate.

- Mechanical Room, Electrical Room, Telecommunication Room, Custodial Room and Storage Area Lighting:

A portion of the fixtures located in these spaces will be fed from the emergency generator system. Room vacancy sensors or digital timer switches will be used to control fixtures in these spaces.

- Restroom Lighting:

A portion of the fixtures will be connected to the emergency generator system and will be used as night-lights. Room occupancy sensors will be used to control all other fixtures.

- Site Lighting:

Fixtures will be a combination of pedestrian scale pole mounted LED fixtures, parking lot scale pole mounted LED fixtures, and building mounted LED fixtures. Fixtures will be selected with a precise light output cutoff to minimize intrusion of light spillage onto neighboring property as well as vertically toward the sky. Lighting calculations will be performed in order to guarantee IESNA recommended foot candle levels for a safe environment are met. All outdoor fixtures will be wet rated.

Power/Receptacle Layouts

Receptacle layouts to support computer/office equipment, laboratory equipment, and any additional general-purpose/laboratory needs throughout the facility will be provided. Dedicated receptacles and circuits will be provided as required to support specific equipment locations. Floorboxes/pokethrus will provided to serve portions of large conference rooms/meeting rooms, large laboratories, and other spaces where power/low voltage is required and cannot be fed from a nearby wall. Strategies to minimize the number of floorboxes/pokethrus while still maintaining functionality and future flexibility will be employed. Two or three channel surface metal raceway systems will be provided along the wall in laboratories to support the distribution of power, telecommunications and instrumentation cabling to computer and laboratory equipment. Duplex receptacles will be installed in surface metal raceway systems at intervals coordinate with building users. Receptacles in raceway systems will be connected to alternate 20-amp branch circuits. Mobile casework in the middle of the labs will be fed from devices installed in ceiling mounted lab service panels. A portion of the laboratory power devices will be fed from the optional standby branch of the new generator system. Select receptacles in the labs will be fed from the central UPS system.

All electrical devices will be labeled with the panel source and circuit number. All receptacle branch circuits will be provided with equipment ground conductors. All branch circuit wiring will be copper and will be installed in concealed raceway systems. Ground fault interrupting type receptacles will be provided in all Code required locations, and in all designated "wet" locations throughout the facility.

Electrical Service to Mechanical Equipment

Electrical service to all mechanical equipment will be provided, as required. All necessary starters, disconnect switches, control devices and VFD connections will be provided to ensure a complete and functional system installation. All feeder and branch circuit-wiring to mechanical equipment will be copper and will be routed in conduit. Conduits will be routed concealed wherever possible. A portion of the mechanical equipment will be fed from the optional standby branch of the new generator system.

Lightning Protection System

A complete, master labeled, lightning protection system will be provided for the new facility and will tie into the existing facility's lightning protection system. The new system will be designed and installed in accordance with NFPA, UL and LPI standards and guidelines.

Telecommunications

New fiber/telephone service will be delivered to the new building's telecom main distribution frame room (MDF). Telecommunications equipment rooms and closets (intermediate distribution frame rooms - IDF) will be provided throughout the facility to support the installation of the telecommunications equipment and cabling. Each MDF and IDF will have a grounding busbar installed on the wall and connected to the building's grounding system. The rooms and closets will be located so as to allow for distribution of telecommunications cabling to all spaces in the facility given the inherent limitations of telecom cabling lengths. Telecom system requirements will be fully coordinated with the owner. Telecommunications outlets will be provided at locations directed by KDHE personnel. Additionally, all electrical rough-ins, including necessary receptacles and circuits will be provided to support the installation of the telecommunication system. All telecommunication system power will be fed from the central UPS system.

Security Systems

A video surveillance system will be provided for the new facility. Cameras will be located to view all exterior doors and building access points. In addition, interior cameras will be provided at locations directed by KDHE personnel. A card access or biometric type access control system will be provided for the facility. Systems will control and monitor access into the facility and may be used to restrict access to some locations within the facility. System details will be coordinated with KDHE personnel. All Card Access and Security Camera System power will be fed from the optional standby branch of the new generator system.

Fire Alarm System

A digital, addressable type, fire alarm control system complete with voice evacuation capabilities will be provided to satisfy all Life Safety and Code requirements. The system will be designed in accordance with all current Codes and

standards and will also satisfy all current accessibility guidelines. In addition, all necessary connections will be made for 24-hour fire alarm system monitoring.

BSL3 Laboratory Electrical Requirements

The electrical design will include, but will not be limited to, the following containment/safety room design practices:

- Access to the whole facility as well as the BSL3 suite will be restricted to authorized personnel through the use of a card access or biometric type security system. Additionally, critical individual pieces of lab equipment including fridges, freezers, and incubators in the BSL3 suite will be fitted with card access/biometric devices so only authorized personnel are granted permission to the contents and also so that access can be recorded / tracked
- A video surveillance system will be provided to monitor all access to the facility and BSL3 suite
- Access to containment areas will be controlled by the use of electrically interlocked sets of doors at airlock locations
- All electrical penetrations into containment areas will be adequately sealed to ensure containment within the space, and to allow for decontamination. Seals will be included around conduit penetrations and around cabling within raceway systems
- An intercom system will be provided for communication from inside the BSL3 suite to an area outside of the containment barrier
- Light fixtures in containment areas will be triple sealed, gasketed, and a minimum of IP65 listed. Fixture lenses will be installed with the smooth surface out to provide an easily cleanable surface
- The emergency generator system will serve all life safety loads in the suite including egress lighting, BSL3 room lighting, and fire alarm system. Additionally, the following loads be fed from the generator: all supply and exhaust systems, pumps to support building heating and cooling systems, HVAC controls, all receptacles in the lab, power to equipment including refrigerators and freezers in lab areas, and any other critical loads as required per the facility users/director. UPS power will be provided to select pieces of equipment and receptacles as coordinated with facility director and published standards for BSL3 lab design

Sustainability Considerations

The following electrical system strategies shall be considered for inclusion in this project that help with the conservation of energy and promote green building technology:

- Photovoltaic Solar Array – Roof Mounted or Covered Parking Mounted
- Electrical Vehicle Charging Stations
- Wind Energy Harvesting
- Task Lighting for all building occupants. This strategy coupled with dimmable room lighting can save energy by allowing individual users to select the amount of light they need for their individual task while not having to light the whole space at full illumination
- Lumen Maintenance Lighting Controls
- Energy Star Rated Appliances

Forbes Field Option

The Forbes Field Option differs from the other two site options for the new facility in that the existing utility plant may be usable for supplying chilled water and heating water necessary for HVAC cooling and heating, respectively. The new generator system will need to refeed some of the equipment in the utility plant so that the new KDHE building would have enough cooling and heating to maintain critical processes in a power outage event. This could potentially add additional electrical distribution equipment, feeders, and phasing costs.

LABORATORY NARRATIVE

Laboratory Modules

The proposed KDHE Laboratory shall be a highly successful analytical testing facility intended to foster efficient sample, personnel and material flows. The Laboratory shall be designed as a secured flexible space with enhanced utilities to support multiple groups and continue to accommodate health and environmental testing into the future.

A laboratory planning module has been developed that will provide a common yet highly adaptable planning unit for multiple lab types. Using a consistent planning module will allow for fully adaptable lab spaces that will support the unique laboratory needs with minimal retrofit as these needs evolve in the future. In conjunction with the planning module, all MEP services and utilities will be distributed to the open lab space that consists of such elements as Heating Ventilation and Air-Conditioning Systems (HVAC), point exhaust, power/data, cylinder gas piping, and other lab utilities. With shut-off valving in the corridor space.

Laboratory Concepts

The laboratory module has been designed as 11'-0" x 33'-0" (363 ASF), which is based on the most efficient and flexible space plan for the testing lab functions at KDHE. Lab support equipment such as vacuum pumps, chillers and power supplies can be located in adjacent Lab Support or the Lab Equipment Alcoves, providing more control of the lab environment by removing these heat and noise sources from the main lab environment.

The key design issues are the environmental parameters: temperature, lighting, vibration, acoustics, as well as the physical requirements of the research equipment, such as ceiling heights, plumbed utility and electrical loads. Flexibility in use and systems is a critical need of the vision statement to allow for the evolution of programs and development of diverse program needs.

House Systems Distribution

Power will be uniformly distributed to all laboratories.

House utilities include:
- Clean Dry Air at 100 psi (CDA)
- Natural Gas (NG)
- Nitrogen (N2)
- Industrial Cold and Hot Water (ICW/IHW)
- Emergency Shower/Eyewash Tempered Water (ES/EW)

Piped Utilities from the cylinder room include:
- Hydrogen (H2)
- Argon (Ar)
- Helium (He)

Specialty Gas (SG) from cylinder tanks will be provided by the lab users including any special cylinder cabinets, manifolds, piping and valves.

While the general laboratories do not need to meet specific cleanliness levels or certified clean rooms, cleanliness is important for the performance of the testing conducted. Therefore, filtration will be provided in the air handling units supporting the labs. See mechanical section for more info.

Many of the individual laboratory environments are predicated upon the needs of specific pieces of equipment. Lab lighting will be provided by pendent hung direct/indirect LED-Light Emitting Diode light sources. Luminaires will have a user controllable dimming in order to tailor light levels to the use of the room. In addition to the dimming of white light, the ability to provide low-level illumination for light sensitive experiments will also be provided in the lab areas.

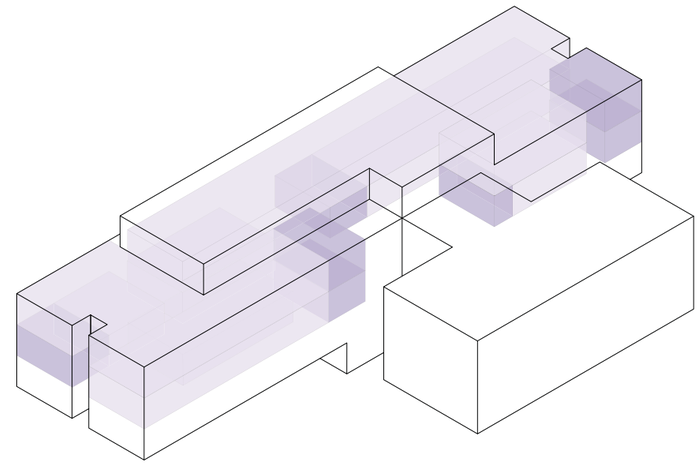
5.0

CONCEPT DESIGN

PROGRAM COMPONENTS

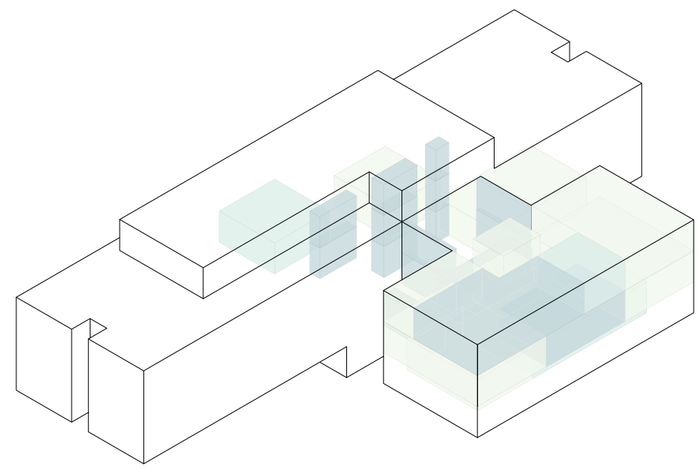
The proposed building is organized in an "I" shaped footprint in order to maximize the geometry of the site as well as provide a high capacity of daylighting and views towards the Capitol building. Major circulation for the building creates a double loaded corridor that follows the "I" shape of the building. Laboratory floors are organized such that laboratory departments that interact frequently are adjacent to one another, and certain departments have hot door access when needed. Office spaces are grouped together, but still in close proximity to appropriate laboratories.

Every space that benefits from daylighting will have access to windows and views. Similarly, the footprint of the building will accommodate a basement and penthouse for maintenance and other building support. Receiving and Accessioning will occupy the ground floor, and will have access to all departments through vertical circulation. Opportunities for multidisciplinary interaction will be increased due to the nature of public and collaboration spaces.



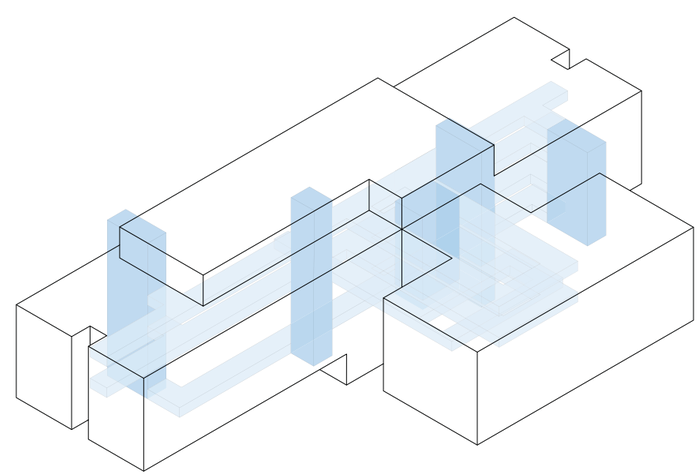
Laboratory + Support

- Laboratory
- Laboratory Support



Office + Training

- Offices
- Training + Conference
- Social + Collaboration



Primary + Vertical Circulation

- Horizontal Circulation
- Vertical Circulation

COURTYARD

The network of greenspace near the Kansas State Capitol building is a major amenity for State employees, administration, and the public. Just as the network of greenspace is important to the Capitol site, creation of multiple green space entry experiences that link this proposed building to downtown pedestrian flow was a driving factor in the design. In this way, new construction can contribute to the built environment as well as the overall downtown context. Various components such as storm water management, native planting, connectivity and break-away spaces are proposed design drivers for the courtyard and entry spaces.

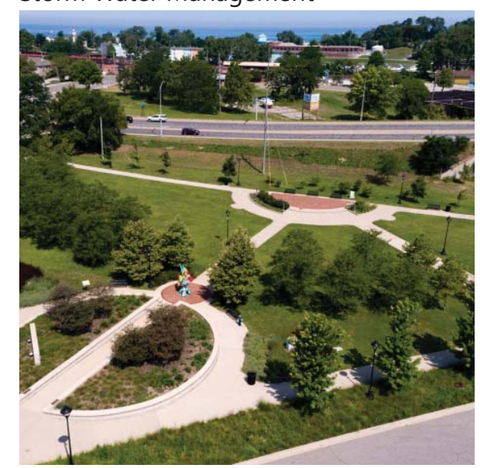
Concept Image

Native Trees

Native Planting

Native Grass

Storm Water Management

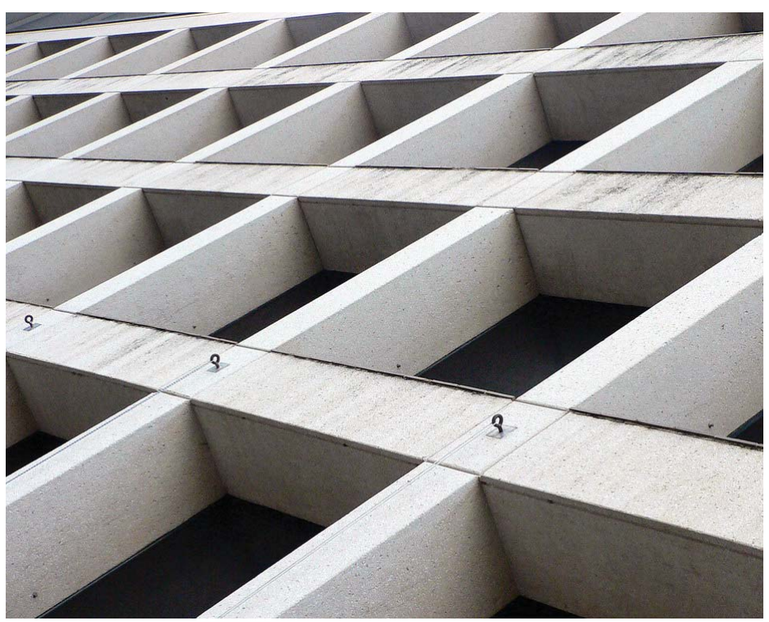


Connectivity

Break-Away Space

PLANNING GRID

Structural elements for this building type work well with cast-in-place construction due to the inherent stiffness of the structure and the need to limit vibration caused by foot fall, mechanical equipment, vehicular traffic and other environmental adjacencies. Organization of the structure will be accomplished through the use of a 22 by 33 foot modular planning grid in order to achieve maximum flexibility for laboratory functions that rely upon bench and floor mounted equipment. Alignment of laboratory modules with the spacing of structural elements is critical for achieving high space utilization in laboratory environments.



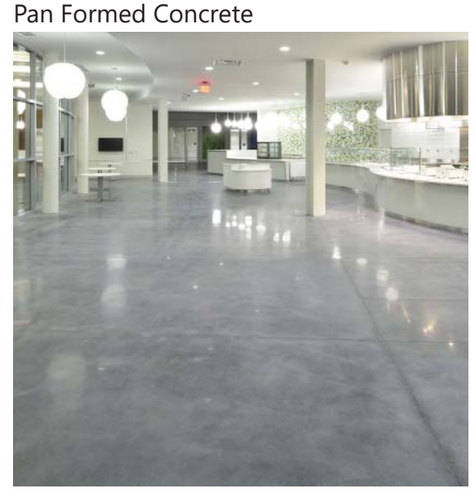
Concept Image

Precast Concrete

Board Formed CIPC

Pan Formed Concrete

Sand Blasted CIPC

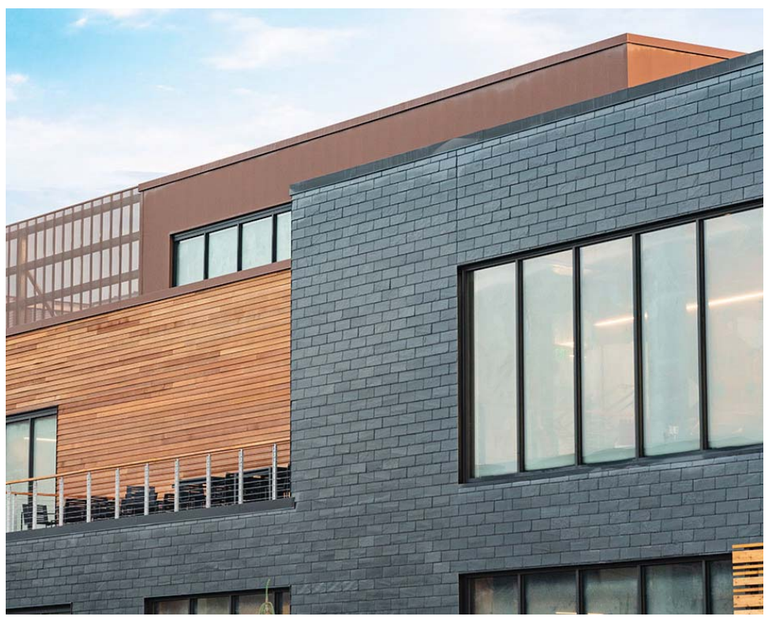


Polished CIPC

Module Spacing

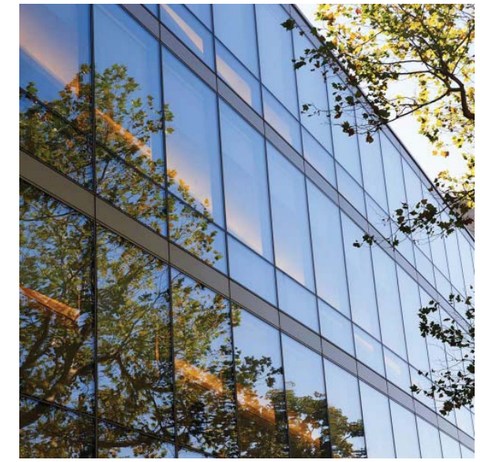
MATERIALITY

As the focus of the design process moved from downtown connection, to solid base, to monolithic structure, and finally to patterning elements framing the programmed space, a major influence became tones and patterns found in the landscape. The natural variation of each individual piece of slate becomes hidden gems within the rigid structure of stone. In much the same way, materials that are detailed with thoughtful variation can connect the building to the surrounding natural habitat and the accompanying rich history.



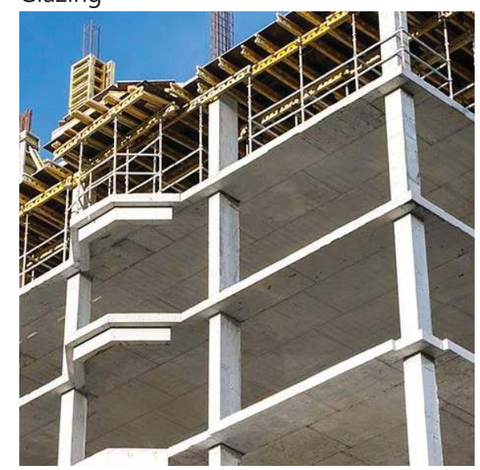
Concept Image

Slate



Glazing

Natural Stone



Concrete Structure

Wood

Resistant Interiors

CONCEPT IMAGERY

Views and spaces created throughout the course of concept design have been developed via digital rendering in order to visualize opportunities available in and around a project's beginning. A mix of entry sequences as well as both exterior and interior amenities allow this project to fully engage the downtown site. Not only should this project provide much needed laboratory and research space for the State, it should add to and improve upon the ability for everyone in the facility to work in collaboration and with efficiency.

KDHE

LABORATORY

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