Kansas State University

Mosier Hall – Research Suite – Consolidated Biomedical Core Facility Renovation

PROGRAM

October 2021

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(images by Clark Enersen Architects)

Introduction

The Kansas State University College of Veterinary Medicine is dedicated to scholarship through innovation and excellence in teaching, research, and service to promote animal and human health for the public good. Part of the Veterinary Medicine Complex, Mosier Hall, constructed in 1975, is home to the Veterinary Health Center (VHC), the Department of Veterinary Clinical Sciences, Diagnostic Medicine/Pathobiology and Research.

In 2019, the College identified -

- Current spaces within Mosier Hall did not meet the needs for delivery of clinical service or clinical training of students in primary care of dogs and cats.

- The existing Auditorium used to support teaching and training across all curriculums was outdated and did not have current technology or a configuration that supported the education and training required for veterinary medical education.

- Additional space was needed to support research.

A project with three phases was proposed. Phase 1 and 2 included -

- the reconfiguration and renovation of existing areas within Mosier Hall to create a New Pet Health Clinic to address the needed critical functions of clinical training. This reconfiguration included adding a floor within the existing outdated two-story auditorium space to create space on first floor for the Pet Health and space on the second floor for a future research suite.

- Addition of a contemporary auditorium to address teaching needs.

Phase 1 was completed in the Fall of 2020.

Phase 2 was completed in the Spring of 2021.

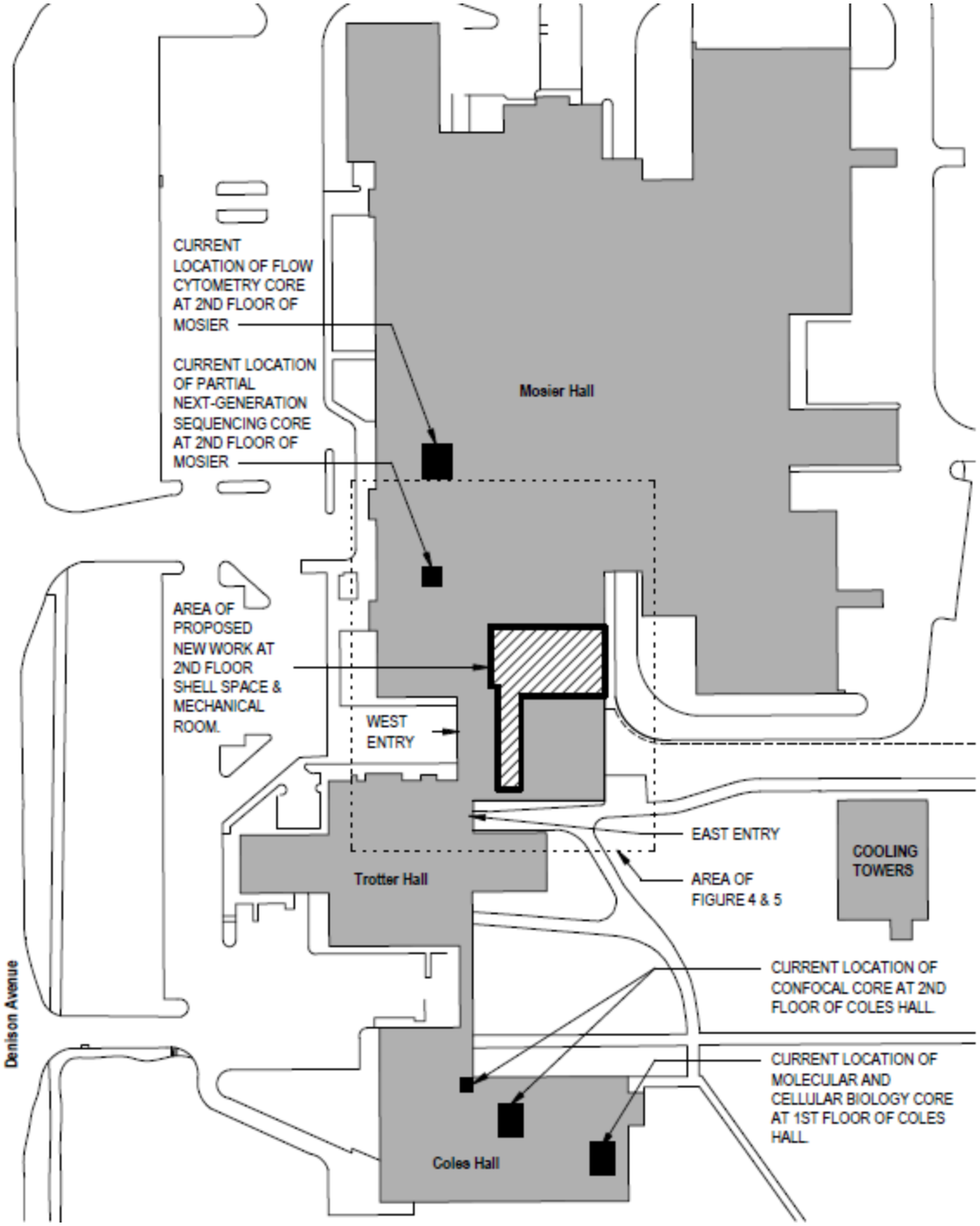
Phase 3 was not funded or timeline provided. Phase 3 scope was to create a research suite within the shell space created in Phase 1. The College continued to pursue funding and in the spring of 2021, the College of Veterinary Medicine applied for a National Institute of Health Grant for construction funding for a research suite. The following statement was included in the application.

> Kansas State University is a Carnegie R1 Doctoral University at the Very High Research Activity level on an upward trajectory of research growth for the last 18 years. The current proposal aims to continue this path by constructing a new core facility consolidating four areas of technology, confocal microscopy, molecular and cellular biology, flow cytometry, and next-generation sequencing. Investigators at KSU and in the region rely on these core facilities as an integral part of the infrastructure used to complete experiments outlined in their current and future research projects. However, the existing space occupied by these facilities is inadequate in size, function and flexibility. In addition, they are isolated and insufficient for modern collaborative biomedical research. This proposal is for completion of 5,000 GSF of new shell space at the KSU College of Veterinary Medicine campus. The proposed core-facilities suite is the final element of a three-phase renovation. Phase 1 delivers a contemporary 220-seat auditorium (8,200 sf) adjacent to Mosier Hall. The expansion is privately funded and currently under construction (July 2020 completion). The new auditorium replaces an outdated 180-seat two-story auditorium in Mosier Hall. Phase 2 provides a primary-care clinic (4,200 sf) for student training and occupies the 1st floor of the deconstructed auditorium. Construction begins May 2020 and is privately funded (Dec 2020 completion). Phase 3 is the focus of this proposal and provides a collaborative, university-wide research facility. The core-facilities suite will occupy the 2nd floor of the deconstructed auditorium space providing 3,370 NSF of new space. This proposal will enhance our university core facilities by creating a centrally organized, integrated technology pipeline, with proximate expert assistance and training support to facilitate efficient use of contemporary technology in confocal microscopy, laser capture microdissection, flow cytometry, cell sorting, DNA/RNA sequencing and CRISPR technology. This enhanced core-facilities suite will assemble select technologies to a single location to deliver efficient, coordinated services for university and regional investigators in imaging and molecular analyses, ranging from whole tissues to nucleic acid. A dedicated modern biomedical research facility with advanced instrumentation and technical support will foster collaborative, transdisciplinary

science, critical to promoting a robust university research and training environment where biological and biochemical researchers can answer the most challenging and urgent biomedical questions.

In September 2021, the National Institutes of Health awarded a grant to the College of Veterinary Medicine for the Consolidated Biomedical Core Facilities Supporting a Center on Emerging and Zoonotic Infectious Disease Research.

Site Map



Current Conditions and Project Description

The project goal is to construct a new core-facility suite consolidating four existing core facilities: Confocal Microscopy, Molecular and Cellular Biology, Flow Cytometry and Next-Generation Sequencing. The approach is to construct collaborative, university-wide core laboratories in the shell space on the second floor of Mosier Hall.

This enhanced core-facility suite will assemble select core facilities in a single location to deliver efficient, coordinated services for university and regional investigators in imaging and molecular analyses, ranging from whole tissues to nucleic acid. Benefit: A dedicated modern biomedical research facility with advanced instrumentation and technical support will foster collaborative, transdisciplinary science, critical to promoting a robust research and training environment where biological and biochemical researchers can answer the most challenging and urgent biomedical questions.

The existing space occupied by existing Confocal Microscopy, Molecular Biology, Flow Cytometry, and Next-Generation Sequencing cores is inadequate in size, function, and flexibility. Described below are each Core's existing space, fixed equipment, infrastructure deficiencies, and solution to the problem.

Currently the existing Conofocal Core occupies 498 sf in Coles Hall, the Molecular Biology Core occupies 384 sf in 123 Coles Hall, Flow Cytometry occupies 600 sf in Mosier Hall and The Next-Generation Sequencing Core occupies 48 sf of space divided between two laboratories that are 1.3 miles apart in separate buildings (CVM East and Mosier Hall). The College will study this existing vacated space with regards for future efficiencies and collaborative opportiunities.

Conofocal Core

Existing Space and Fixed Equipment - There is no fixed equipment. Four Confocal microscopes and Freezer .

Infrastructure Deficiencies - Suitable space is the key deficiency limiting operation of the Core. At times, researchers must delay or forego use of the Confocal Core because demand exceeds availability. A researcher from another KSU college would like to move his underutilized confocal microscope to the Core to enhance investigator accessibility and support by our professional Core manager. Current space prohibits us from considering this move. Space configuration is also imperfect. Two of the three confocal microscopes share a single room. This creates workflow issues. In addition, the existing Confocal Core facility suffers from inadequate airflow and control, creating unpredictable temperature fluctuation and poor air quality.

Solution to the Problem - The proposed facility would allow separate rooms without windows for housing of individual microscopes and facilitate concurrent use by multiple researchers. Each room requires separate HVAC, and 10 linear feet of usable bench work surface per workstation for sample preparation.

Molecular and Cellular Biology Core

Existing Space and Fixed Equipment - There is no fixed equipment. The Core has 27 linear feet of bench space. Scientific instruments in the Core include two Nanodrop spectrophotometers (Nanodrop 8000 and ND 3300), two 96-well RT-PCR thermocyclers (Applied Biosystems StepOne Plus, an Agilent Bioanalyzer 2100, a pipetting robot (Beckman Coulter Biomek NXp), and blot and gel imagers.

Infrastructure Deficiencies - The main deficiencies in the Molecular Biology Core are location, size (384 sf) and technology. The Core is inconveniently located in the far southeast corner of the CVM complex. Collaborative interactions are almost impossible. Relocation of complementary instrumentation from other areas of the complex will strengthen the services of this core.

Solution to the Problem- The Nanotechnology Laboratory established in 2012 in Mosier Hall, is also isolated from similar instrumentation and would strengthen this core. A partial list of the equipment that will be relocated to strengthen the Molecular and Cellular Biology Core includes a Luminex® 200™ system, an Applied Photophysics Chirascan CD spectrometer, and an Olympus IX73 inverted fluorescent microscope system, which allows live-cell imaging in a temperature- and CO2-controlled environment. A CytoViva enhanced darkfield hyperspectral microscope, a NanoSight LM10 microscope, a SpectraMax i3x multi-mode microplate reader, and the IVIS Spectrum, and Pearl Trilogy in vivo imaging systems will be moved to the core-facility suite. The relocated equipment will be included in the consolidated core-facilities suite as part of four main research areas: the

Molecular and Cellular Biology Core, an imaging/microscopy area, the Flow Cytometry Core, and a live-animal imaging area. In each of these areas, this equipment will offer enhanced access and support to research users. Although this equipment is currently available within the CVM, consolidating it within the corefacility suite will improve accessibility to both equipment and professional managers, thus strengthening the research capabilities of investigators institution-wide. Integration of the Molecular Biology Core into the expanded Molecular and Cellular Biology Core will enhance productivity and increase equipment use, creating synergy between all parts of the proposed core.

Flow Cytometry Core

Existing Space and Fixed Equipment - There is no fixed equipment. There are 53.8 total linear feet of bench space in the Core; however, bench-top equipment and computers occupy 37.8 feet. Scientific instruments utilized in the Flow Cytometry Core include a state-of-the-art BD Biosciences LSR FortessaTM X-20 special order research product flow cytometer equipped with violet, blue, yellow-green, and red lasers and appropriate bandpass filters and detectors allowing users to perform polychromatic (13 color) and 2-dimensional parameter analysis. Other equipment available for research use include a Luminex xMAP® MAGPIX®. Although almost 54 feet of bench space would seem sufficient, the majority of preparation bench space in the facility is diagnosticuse space leaving only 5 ft of bench space for research projects. Lack of preparation space is significant because flow cytometer usage is increasing in both the research and diagnostic arms of the Core. Particularly troublesome for flow cytometry users outside of the CVM is the fact that no tissue-culture space is available.

Solution to the Problem - The proposed new Flow Cytometry Core will allow for a flow-cytometry research facility separate from diagnostic use, increasing availability of the equipment and providing ample preparation space, including tissue-culture space, to encourage more research users.

Next-Generation Sequencing Core

Existing Space and Fixed Equipment - There is no fixed equipment. NGS equipment includes an Illumina MiSeq, an Illumina NextSeq, an Ion Torrent PGM and a Nanopore MinIon. The Illumina machines are in K217 Mosier Hall while the Ion Torrent and MinIon are in part of Laboratory 1017 in CVM East.

Infrastructure Deficiencies - The NGS equipment has specific housing requirements including limited vibration and neutral air pressure. The machines pull exterior air; therefore, air quality is crucial to consistency and longevity. Meticulous laboratory design is necessary to limit contamination, minimize vibration and maintain reliability.

Solution to the Problem - A common molecular biology laboratory space would fulfill the needs of the NGS Core by providing a dedicated, clean space for these sensitive machines.

Applicable codes, standards and guidelines - The proposed fit out of the core-facility suite will be designed and engineered in accordance with the most recent versions of following codes, standards and guidelines:

Design Documents MUST meet all requirements (without exception), outlined in the latest version of the NIH Design Requirement Manual (DRM). Design Dcoument submittals will be reviewed by NIH based on the DRM.

- ICC International Building Code and reference standards
- ICC International Fire, Plumbing, and Mechanical Codes
- National Institutes of Health (NIH) Design Policy, Guidelines, and Design Requirements Manual
- AAALAC Guidelines as outlined in: Guide for the Care and Use of Laboratory Animals
- CDC/NIH Biosafety in Microbiological and Biomedical Laboratories (BMBL) 5th Edition
- Kansas State University Consultant Procedures and Design Guidelines
- National Fire Protection Association (NFPA) Standards
- NFPA 70 National Electrical Code (NEC)
- American National Standards Institute (ANSI)
- Americans with Disabilities Act Accessibility Guidelines (ADAAG) and ANSI 117.1
- American Society for Testing and Materials (ASTM)
- Underwriter's Laboratories, Inc. (UL)
- National Electric Manufacturers Association (NEMA)
- American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) Standards

- National Electrical Safety Code (NESC)
- Illuminating Engineering Society (IES) Lighting Handbook

Construction Rating Requirements and Building Classification

- Structural Frame – 2 Hr. (IBC Table 601)
- Exterior Load Bearing Walls – 2 Hr. (IBC Table 601)
- Exterior Non Load Bearing Walls – 0 Hr. (IBC Table 601)
- Non Load Bearing Partitions – 0 Hr. (IBC Table 601)
- Interior Load Bearing Walls and Columns – 2 Hr. (IBC Table 601)
- Floor Construction – 2 Hr. (IBC Table 601)
- Roof Construction – 1 Hr. (IBC Table 601)
- Corridors – 0 HR. (IBC Table 1020.1)
- Shafts – 1 HR. (IBC Section 713.4)
- Use Group B – Business (IBC Section 304)
- Construction Type – Type II B (sprinkled) (IBC Table 503)
- Allowable Building Height – 12 stories (IBC Table 503)
- Allowable Area – Unlimited per floor (IBC Table 503)

The proposed core-facility suite includes interior fit out of the existing shell space on the 2nd floor of Mosier Hall along with new mechanical equipment installed in the adjacent mechanical penthouse as well as the roof area immediately above the core-facility suite. The core facility will be adjacent to other research areas on the 2nd floor of Mosier Hall and will have immediate proximity to the public elevator serving the south side of Mosier Hall.

The total renovated square footage provided by the shell fit out of the core-facility suite is 5,000 GSF including 500 GSF of mechanical penthouse space.

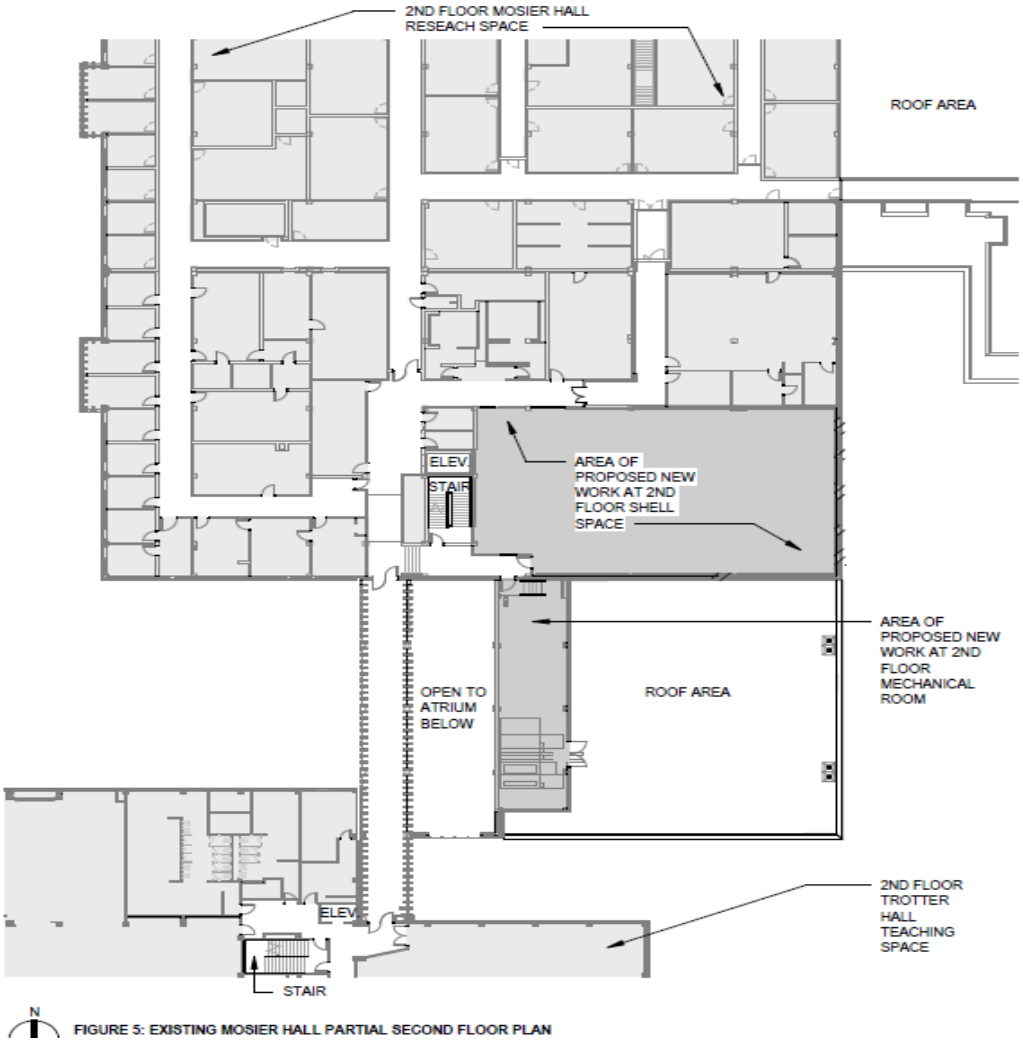


FIGURE 5: EXISTING MOSIER HALL PARTIAL SECOND FLOOR PLAN

The construction of the shell fit out shall be consistent with that of the NIH DRM.

The laboratory areas of the core-facility suite are to be constructed to meet NIH requirements for BSL2 space.

The exterior walls are to include new window openings, continuous cavity wall insulation, and continuous air barrier membrane. The interior face of exterior walls are to be furred and finished with painted gypsum drywall throughout the entire suite.

The structural floor of the shell is composite steel construction, utilizing steel girders and beams supporting composite metal deck and a 5" reinforced concrete slab. The roof structure is framed with steel girders and joists supporting a metal roof deck, rigid insulation and a TPO membrane roof system. The entirety of the 2nd floor shell space is a column free area and all steel members are fireproofed to meet the rating requirements of the building.

Corridors throughout the suite are to be 6'-0" wide. Walls and ceilings are to be a cleanable system suitable for laboratory use.

Flooring is to be a seamless epoxy resinous system over concrete substrate with coved wall base.

All doors to be 3'-6" wide, solid core, commercial grade, wood with transparent finish. Sliding doors to have heavy-duty frames with single-action egress levers.

Card access to be installed on all doors within the suite corridor so that access can be granted and monitored for each user. See Table 1 Room Information Summary for proposed finishes within each space.

Inside the suite are four core facilities supported by multiple research spaces. Each research space is to be arranged using a 10'-7" x 11'-0" planning module to best utilize the existing area. Each space to have painted steel, fixed casework with epoxy counters. Biological safety cabinets are to be included throughout the suite for primary containment of biological material.

Support spaces include shared workspace and lockers for visiting researchers, a collaboration space to enhance idea sharing among all users, and a core manager workspace. Additional support spaces include….

an area dedicated to sterilization of biohazardous materials for safe disposal outside of the suite

an area dedicated to liquid nitrogen cryogenic freezers with a liquid nitrogen fill station for conservation of cell lines, an area for manifolded cylinders for equipment utilizing CO2 and N2

a working cold room for DNA research

an area for shared use of a chemical fume hood for chemical dispensing

a dedicated server rack room for bioinformatic computing. Each core facility research space to be equipped with safety features including proximity to eye wash and safety showers, clear egress paths, backup power, and cleanable durable materials. See Table 2 Equipment List for requested fixed equipment.

Green/Sustainable Design

In the development of the design for this project all viable options are tol be evaluated to maximize the opportunities for sustainable design. Some key areas of focus will include:

- Utilize a third-party commissioning agent to review systems design and systems implementation.
- Design to minimize water usage within the facility.
- Design of mechanical and electrical systems to minimize energy usage.
- Selection of materials high in post-consumer recycled content.
- Use of paints, coatings, sealants and adhesives that have recommended low levels of volatile organic compounds.
- Provide natural daylight within occupied spaces including the addition of skylights.
- Incorporate user controllability for lighting systems while still meeting specified requirements.
- Develop the construction schedule to allow for building flush out to minimize the chance of off-gassing within the building.

Quality of Life Issues

To the greatest extent possible, the proposed additions will introduce natural light into occupied spaces. Noise and vibration issues shall be taken into account by the selection of appropriate materials to dampen and minimize these issues.

The project shall be designed and materials specified to achieve a high level of indoor air quality. This is to be achieved by utilizing low VOC coatings and materials, by improving air distribution, and by improving temperature control in all renovated spaces.

Environmental Considerations

KSU has a comprehensive EHS program. All users and purchasers of hazardous materials must be registered with the EHS Office. The EHS staff is responsible for collection and management of unwanted hazardous materials. KSU is classified as a large-quantity hazardous waste generator by the US Environmental Protection Agency and the Kansas Department of Health and Environment. As a large-quantity generator, KSU must ship all hazardous waste off campus for disposal within 90 days of receiving the waste at its central storage facility.

Mechanical

Air Handling Systems A new 100% outside air handling unit (AHU) shall be provided to serve the core facility

on the second floor. The AHU is to be sized to handle the entire load of the suite plus 20% additional capacity to handle future growth. The new AHU is to be located in the existing penthouse. The AHU should operate in a variable volume (VAV) mode. The components of the new AHU to be as follows (listed in direction of airflow):

Component Comments
- Outside air dampers Low-leak dampers
- Prefilter bank MERV 8, 2" plated filters
- Final filter bank MERV 14, 12" cartridge filters
- Heat recovery coil bank Runaround water coil, glycol for freeze protection
- Preheat coil bank Heating water coil, pumped for freeze protection
- Steam humidifier High-efficiency dispersion grid
- Cooling coil bank Chilled water coil
- Supply fan(s) Fan array controlled by variable frequency drives (VFDs) N+1
- Sound attenuator Sound attenuator bank
- Discharge dampers Low-leak dampers

Outside air to be introduced to the AHU through a new louver in the penthouse.

The offices, conference room, and restroom to be served off the new 100% outside air handling unit to maintain pressurization in the adjacent lab spaces.

Exhaust Systems - New high plume mixed flow exhaust fans, sized for N+1 redundancy, to be provided on the roof to serve the new laboratory and office/administrative spaces in the new addition. The exhaust fans are to use VFDs to maintain proper airflow and be controlled to maintain a system static pressure setpoint. xhaust discharge from the building to be located as far as feasible from fresh air intakes from other buildings to help prevent air recirculation into the building and maintain proper plume height.

Heat Recovery System - A run-around heat recovery loop to be installed to eliminate any possible cross contamination between fresh air and potentially harmful exhaust air due to the high concentration of exhaust coming from the fume hoods. A field-constructed heat recovery plenum to be installed on the inlet of the exhaust fans and consist of a filter bank followed by a heat recovery coil bank. The coils are to utilize a glycol mixture as the heat transfer fluid to prevent freezing. All internal components are to be either stainless steel or coated steel to minimize corrosion due to the fume exhaust airstream. A pump circulate the fluid between the exhaust heat recovery coils and the AHU heat recovery coil.

Supply and Exhaust Air Distribution Systems - A variable volume (VAV) air distribution system is to be utilized to maintain proper pressurization of spaces and temperature control. Each control zone is to 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 is to operate in a VAV mode similar to the supply air system. Each control zone is tol be served by a corresponding exhaust air valve. The airflow of the exhaust air valve is to "track" the airflow of the corresponding supply air valve to guarantee proper space pressurization is maintained. In laboratory zones, a fume-hood air valve shall 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 air ductwork is to generally be galvanized steel construction. However, all ductwork serving fume hoods, canopy hoods, or other specialized equipment shall be stainless steel construction. A stainless-steel canopy hood shall be provided on the door side of the autoclave to provide capture of moist air released from the chamber and be tied in to the exhaust system.

Ductwork shall be designed and constructed in accordance with Section 6.2 of the NIH DRM.

High-Sensible Load Cooling In the server room, a refrigerant-based split system is to be used for cooling. This approach reduces the capacity and size requirements of the AHU and its associated ductwork.

Chilled Water System - The AHU is to be served by the existing chilled water piping located in penthouse. All coil loads are to be provided with pressure-independent 2-way control valves.

Steam and Condensate System - The AHU will be served by the existing steam and condensate piping located in penthouse. Steam is to be routed to the new autoclave. A new condensate pump will return condensate back to the building loop.

Heating Water System - The existing heating water is to be extended to terminal units in the core facility area from the chase located adjacent to this space.

Energy Management Control System - Existing mechanical systems for the facility are controlled by the campus Energy Management Control System (EMCS). Newly installed mechanical systems are to utilize direct digital controls (DDC). The EMCS is to have the capability to adjust setpoints and system operation to match changing facility functions. Control points tied into the existing EMCS are to include local and remote alarming.

Temperature and Humidity Parameters - The following temperature, ventilation, and noise parameters are to be used as the basis for the design of the building HVAC systems:

- Outdoor Design Conditions:
  - Winter Dry Bulb Temperature: 2.8 Deg. F
  - Summer Design Dry Bulb Temperature: 95 Deg. F
  - Summer Coincident Wet Bulb Temperature: 78 Deg. F
- Indoor Design Conditions:
  - Winter Dry Bulb Temperature:
- Lab and support areas 72 Deg. F
- Office/general areas 72 Deg. F
  - Summer Dry Bulb Temperature:
- Lab and support areas 72 Deg. F
- Office/general areas 75 Deg. F
  - Relative Humidity:
- Summer – Autoclave areas 55-65% RH
- Summer – All other areas 45-55% RH
- Winter – All areas 35-50% RH
- Minimum Ventilation Rates:
  - Autoclave Minimum 10 ACH
  - Lab and support areas Minimum 6 ACH
  - Office/general areas Minimum 6 ACH

Plumbing Systems - Existing waste/vent, domestic hot and cold water piping are to be modified for the corefacility spaces. Backflow prevention devices are to be utilized for all fixtures requiring laboratory hot and cold water to prevent the contamination of the domestic waters. Temperature mixing valves are to be provided to serve any emergency fixtures (eye wash and emergency showers) in compliance with ANSI standards.
Plumbing fixtures that may be exposed to corrosive solvent shall have localized neutralization tanks at each fixture.

Pure Water Systems - High purity water is to be generated by a single water purification skid. The equipment To include carbon filters, reverse osmosis (RO) equipment, deionization (DI) tanks, ultraviolet (UV) sterilizer, and 0.2-micron filters. The water is to be stored in a storage tank in the mechanical penthouse. Recirculating pumps shall continuously circulate the pure water through a polypropylene pipe loop to inhibit bacterial growth caused by stagnant water. Small dead legs of piping are to connect the recirculating loop to the laboratory pure water faucets. The water quality produced by this system is to be equivalent to CAP/NCCLS Type II reagent water (1.0 megohms-cm, 1.0 micromhos/cm, 0.1 mg/L SiO2, 1000 cfu/mL) and USP 27 standards or better.

Laboratory Gases Laboratory air and vacuum is to be extended from the existing building systems. The compressed gas cylinders with automatic switchover manifold are to be provided and piped to outlets and equipment throughout the renovated area.

Liquid Nitrogen - A new bulk liquid nitrogen tank is to be located to the east of Mosier Hall on grade and will supply the liquid nitrogen freezers and dewar fill station located within the renovated area. An emergency exhaust system with oxygen monitoring and alarming is to be installed in the event of a spill or leak that would displace oxygen.

Fire Protection The facility is currently served by an existing wet-pipe sprinkler system. The system is to be modified as necessary to provide full-coverage for all renovated areas. All work will comply with NFPA 13 and other local requirements.

Electrical

Electrical Distribution System The existing 480Y/277-volt, 3 phase, 4 wire normal power electrical service to the facility and subsequent existing distribution panels is to be utilized to feed new electrical distribution equipment serving the spaces identified in this project. The building's existing diesel-driven generator and its associated distribution system is to be utilized to serve all new optional standby electrical distribution equipment. Both the generator and the normal power electrical service are to have adequate capacity to serve this project's spaces while maintaining future flexibility.

The existing electrical room on the same floor as, and adjacent to, the lab spaces identified in this proposal contains existing distribution panels that will be utilized to feed new electrical distribution equipment. New normal power and emergency/standby power 208Y/120-volt, 3 phase, 4 wire branch panelboards is to be added under this project's scope. The new branch panelboards are tol be recessed adjacent to or within the lab spaces.

In general, HVAC equipment and large equipment loads will be served at 480 volts, 3-phase. Lighting throughout the facility will be served at 277 volts, single phase. Laboratory, office, computer equipment, and 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.

The emergency generator system will serve critical, optional standby loads including supply and exhaust systems, HVAC controls, refrigerators and freezers in laboratory areas, incubators, biosafety cabinets, telecommunication systems, security systems, and any other critical loads as required per the facility users/director.

For all branches of power, new branch panelboards are to make use of circuit breakers for overcurrent protection and will be fully rated to accommodate short circuit characteristics within the facility. Copper bussing is to be provided for all electrical distribution system equipment.

The new electrical distribution equipment is to allow for the following:

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

Electrical Service to HVAC Equipment **-** Normal and emergency electrical service to new HVAC equipment Is to be provided as required. All necessary starters, disconnect switches, control devices and VFD connections is be provided to ensure a complete and functional system installation.

Receptacle Layouts **-** Receptacle layouts and circuiting to laboratory equipment, lab benchtops, computers, special purpose, and general-purpose needs are to be provided in accordance with direction from facility personnel. All electrical devices shall be labeled with the panel source and circuit number. Dedicated receptacles are to be provided as required to support specific equipment locations. All receptacle branch circuits shall be provided with equipment ground conductors and dedicated neutral conductors. All branch circuit wiring shall be copper and installed in concealed raceway systems. Ground fault interrupting type receptacles shall be provided in all other Code required locations, and in all designated "wet" locations throughout the facility.

Lighting **-** Lighting systems throughout the facility shall be designed in accordance with NIH policies and guidelines, Kansas State University design guidelines, IESNA recommendations, and required energy code. Lighting power densities are tp be minimized by using highly efficient, LED fixtures throughout. Task lights is tol be provided at individual work areas as coordinated with lab users in order to provide task specific light levels. Occupancy/vacancy sensors are to be used throughout non-laboratory spaces to provide automatic off of lighting loads during unoccupied times. 0-10V dimming for LED light fixtures is to be provided for all spaces in order to maximize flexibility while providing user comfort.

Telecommunications - The existing telecommunications room located on the same floor as, and adjacent to, the lab spaces identified in this proposal is to be utilized. The telecom room will support the installation of all university-provided telecommunication equipment and cabling. Telecommunication devices are to be provided throughout each space as coordinated with lab users.

Security Systems - A video surveillance system is to be provided for the spaces identified in this proposal. Cameras will be located to view all lab entry/access points from the main corridor. A card access or biometric type access control system is to be provided. Systems are to control and monitor access into the lab suite and l be used to restrict access to most rooms within the lab suite as well. System details are tol be coordinated with university personnel.

Equipment Monitoring System - All significant non-fixed equipment is to be equipped with monitoring systems that notify appropriate personnel upon failure.

Fire Alarm System - The existing facility addressable fire alarm system is to be modified and expanded as required to support facility addition requirements. The system shall be designed in accordance with all current Codes and standards and satisfy all current accessibility guidelines.

The following is new equipment to be purchased with this project.

TABLE 2: EQUIPMENT LIST

EQUIPMENT	MANUFACTURER	SIZE
Class II A2 Biosafety Cabinet	Kewaunee	4'-0"
Class II A2 Biosafety Cabinet	Kewaunee	4'-0"
Class II A2 Biosafety Cabinet	Kewaunee	4'-0"
Class II A2 Biosafety Cabinet	Kewaunee	4'-0"
Class II A2 Biosafety Cabinet	Kewaunee	4'-0"
Class II A2 Biosafety Cabinet	Kewaunee	6'-0"
Class II A2 Biosafety Cabinet	Kewaunee	6'-0"
Class II B2 Biosafety Cabinet	Labconco	4'-0"
Class II B2 Biosafety Cabinet	Labconco	4'-0"
Liquid Nitrogen Bulk System	Chart Industries	42" diameter x 89" height
Sterilizer	Steelco	21" x 21" x 38" Chamber
Chemical Fume Hood	Kewaunee	4'-0"
Working Cold Room	Bio Cold	11'-0" x 9'-0"
Fixed Casework	Kewaunee	380 linear feet

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Space Summaries

Name of Space	Approximate Size of Space	
Existing Mechanical Room (renovation of existing space)	500	SF
Conofocal Microscopy Core (4 spaces at 110 SF)	440	SF
Confocal Tissue Prep Lab	210	SF
Core Managers Office (2 at 110 SF)	210	SF
Cell Sorter	110	SF
Flow Cytometry Core (206.7)	110	SF
Flow Cytometry Core (206.9)	410	SF
Core Support	110	SF
Molecular & Cellular Biology Core	350	SF
Cell Culture	220	SF
Cold Room	110	SF
Cryogenic Feezers and Dewar Fill	140	SF
In Vivo Imaging	210	SF
Cylinders	80	SF
Sterilization	170	SF
Shared Workspace	170	SF
Next-Generation Sequencing Core	170	SF
Server	20	SF
Collaboration Room	260	SF
Circulation / chases	1,000	SF
Total	**5,000**	**SF**

Projected Budget

Estimate of Project Costs		Total
Design Fees - (Architect/Engineer, Energy Modeling, Commissioning)		$319,500
Construction (Site Preparation, Demolition, General Contractor)		$2,100,000
Equipment		$280,650
Misc (Test Balance, Construction Material Testing, Telecommunications, Keys, Card Access, Signs, Fire Extinguisher, etc)		$127,000
Adimintration fees (Legal, Project Management, Building Permits, Relocation & Moving Costs)		$168,000
Contingency		$435,783
TOTAL		$3,430,993

Funding

The project will be funded with Federal Award from National Institutes of Health for the Consolidated Biomedical Core Facilities Supporting a Center on Emerging and Zoonotic Infection Disease Research.

Maintenance

Maintenance costs will be funded from university resources, specifically the College of Veterinary Medicine and the Facilities and Maintenance staff located at the College. The existing mechanical room space of 500 SF is currently funded with exiting funds. The annual costs of operations, maintenance and utilities for the new 4,500 SF are estimated as follows:

Description	**Cost/sqft**	**Total**
Operations and Maintenance	$3.23 x 4,500 SF	$ 14,535
Utilities	$3.50 x 4,500 SF	$ 15,750
Total Annual Cost		**$30,103**

Building maintenance sustainability will be funded from university resources, specifically the College of Veterinary Medicine

Construction procurement

This will be a design, bid, build procurement delivery. The project will bid through Department of Administration, Office of Facilities and Property Management – Design, Construction and Compliance. Design and construction administration is to follow policy and guidelines in the Building, Design and Construction Manual.

Timeline/Schedule

Date of Award	September 20, 2021
KBOR program approval	November 2021
Architect Selection	December 2021
Schematic Design to KSU (35% complete)	January 10, 2021
Schematic Design (35% complete) to NIH – no later than	January 20, 2022 *
NIH Review (4-6 weeks)	Jan 20 - March 1, 2022
Design Development (65% complete) to KSU/BOR	June 15, 2022
Design Development (65% complete) to NIH – no later than	July 20, 2022*
NIH Review (4-6 weeks)	July 20 - September 1, 2022
Construction Documents (95-100% complete) to KSU	October 10, 2022
KSU review completed submit to NIH	November 1, 2022
Construction Documents (95-100% complete) to NIH – no later than	January 20, 2023*
NIH Review (4-6 weeks) based on KSU requested time line	Nov 1 - December 15, 2022
NIH Final Record Document submission (4-6 weeks for approval)	January 1-February 15, 2023
Restricted Funds released upon NIH approval (required to advertise for bid)	February 15, 2023
Submittal to OFPM for advertisement and Bidding (4-6 weeks)	February 15-April 1, 2023
Bid Award (2 weeks)	April 1- 15, 2023
Construction (10 months)	April 15 –December 15, 2023
Testing and Commissioning (4-6 weeks)	Dec 15, 2023- Feb 1, 2024
Occupancy	February 1, 2024
Notification to NIH of completion	February 1, 2024
Funds Expiration (56 months from the date of initial award)	May 31, 2026*

*Key dates from NIH - Documents must be submitted no later than this date.