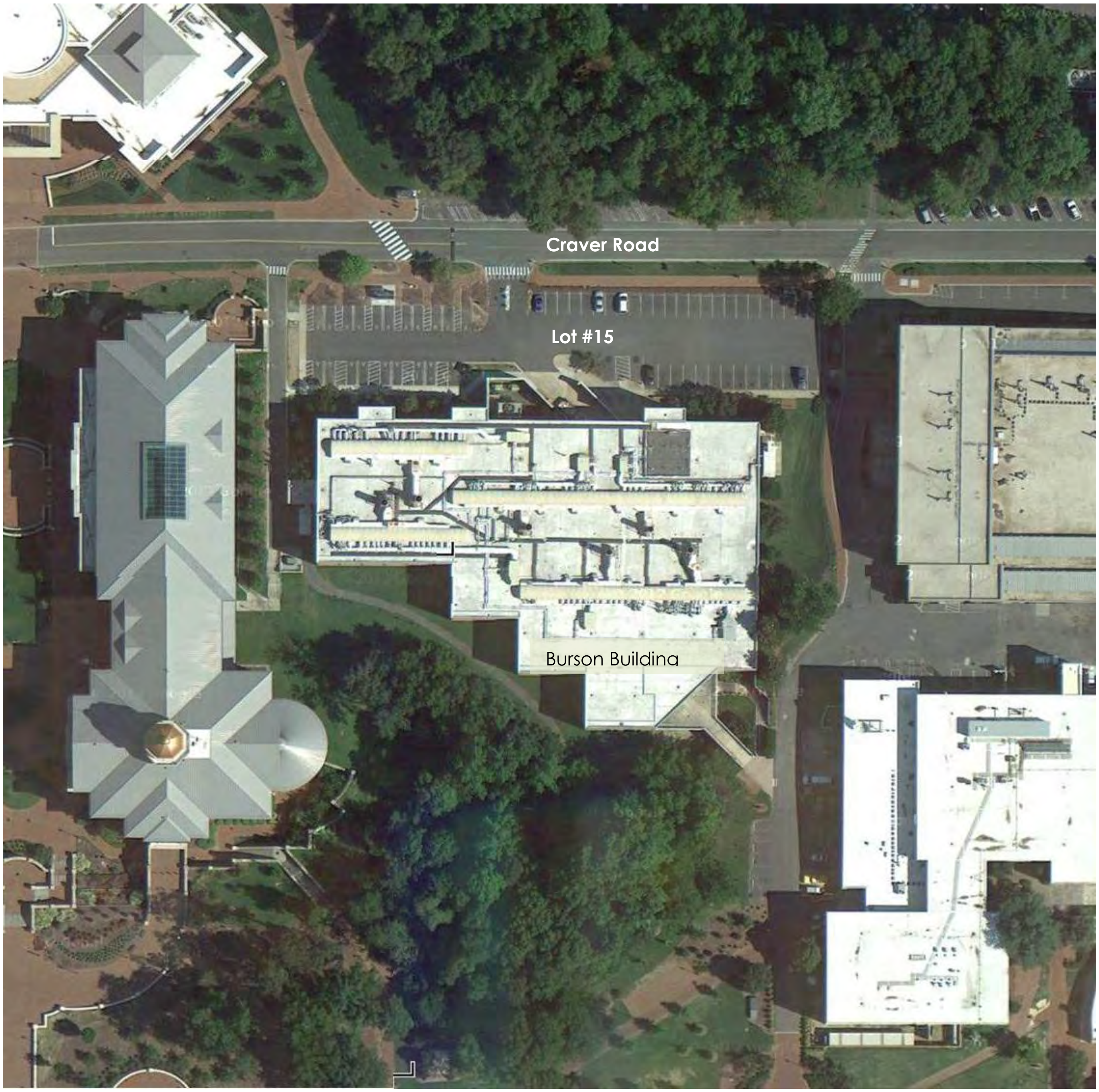
UNIVERSITY OF NORTH CAROLINA at CHARLOTTE

Burson Building Feasibility Study



Stantec

Table of Contents

Section 1
Introduction

1.0 INTRODUCTION

The purpose of this study is to evaluate the feasibility of renovating and/or expanding the Burson Building to adequately support the teaching and research mission of the UNC Charlotte Chemistry Department. This study includes investigating the existing building condition, proposed improvements, increased capacity, estimated construction costs, a phased schedule and recommendations on how best to proceed while maintaining use of the building.

This feasibility study for the potential renovation and/or addition project includes a facility program of requirements (PoR) that outlines the requirements for the existing and new chemistry laboratories, research spaces and support spaces, including but not limited to, chemical fume hoods, laboratory casework, process piping, HVAC, infrastructure, lighting and sprinkler coverage. This feasibility study for potential renovation includes the evaluation of existing infrastructure and energy efficient solutions proposed. Based on a review and analysis of the existing building and infrastructure, graphic layouts for proposed alternate recommendations that accommodate the Chemistry Department's needs are included in this study. The graphic layouts include recommended phasing and budgets for each alternate layout.

History
Completed in summer 1985, the Sherman L. Burson Building was originally dedicated as the Physical Sciences Building. The facility includes a 184-seat tiered lecture hall, a number of smaller lecture halls, and laboratory space. Designed by Peterson Associates of Charlotte, the building was constructed by Butler and Sidbury Inc. for slightly more than $8 million. At the time of its re-dedication in April 1999, the building was noted for its planetarium platform mounted on vibration-resistant pedestals, an underground Van de Graaf linear accelerator in the basement and reinforced concrete radiation labs. The building's design won a national architectural award and was included in the American School and Universities Architectural Portfolio for 1986.

The Burson Building is approximately 100,000 gross square feet with a net assignable area (NASF) of 83,500 square feet. The area is distributed on two levels above grade and a small addition below grade. An Existing Building Assessment was completed in 2007.

Section 2
Executive Summary

2.0 EXECUTIVE SUMMARY

The purpose of this feasibility study was to determine the potential renovation and /or addition of Burson Building to adequately support the teaching and research mission of the UNC Charlotte Chemistry Department as an interim facility until a new science facility is constructed at UNC Charlotte.

The study included the investigation of the:

1. Existing Building Condition
2. Facility Program
3. Proposed Improvements
4. Phasing Schedule
5. Estimated Construction Costs

1. Existing Building Condition

Exterior Architecture

A variety of exterior architectural issues require attention including cracked/displaced brick veneer, severely deteriorating joint sealants, deteriorated exterior stairways, cracked slabs on-grade in the vicinity of the loading dock, displaced window framing, leaking from the outside of the building, deteriorated interior joint sealants, cracked interior floor finishes, and isolated cracked interior masonry walls. Regular leaks have been reported from the existing roof, ponding water exists on isolated areas of the roof, and skylight mechanical enclosures leak as a result of deteriorated joint sealants, deteriorated framing, and loose framing.

Interior Architecture

The condition of the existing interior architectural elements including partitions, finishes, and fixed laboratory equipment is consistent with a building that has received relatively few modifications since it was first built almost 30 years ago. Modifications are required to refresh the architectural finishes to be consistent with other contemporary academic buildings on the UNC Charlotte campus. The existing fixed lab equipment such as lab bench casework and lab bench tops particularly in the teaching labs are in poor condition. The original fume hoods throughout the building are auxiliary air type fume hoods and the auxiliary air bonnet vents have been retrofitted to prevent the discharge of unconditioned air. Many of the room sizes are appropriate for their use and so the locations of many of the demising partitions are generally acceptable. Changes in room requirements and capacities will require reconfiguration of fixed lab equipment in the teaching and research labs. The existing freight elevator does not serve the roof and is in need of refurbishment.

Mechanical - Heating, Ventilating and Air Conditioning (HVAC)
The existing Burson Building mechanical systems cannot consistently maintain space conditions, even after implementation of several previous projects which upgraded the HVAC systems. The existing make-up air systems cannot provide sufficient air to offset the building laboratory exhaust flows, and the resulting building negative pressure results in significant quantities of unconditioned air intruding into the building. This is the primary cause of the often 'out of control' building interior environment. Compounding these issues, the original (circa 1983) temperature control system is largely still in service, as is the original main air handling equipment, and much of the original lab exhaust system. A retro-commissioning of the HVAC systems has not been done within memory and is very much needed, both to determine the true capabilities of the aged systems, and to ensure that they are performing to their limited capability. This is especially needed for the fume hoods where nominal exhaust air flow is 30% greater than the total building HVAC make-up air capability. In addition, the student exhaust hoods in the teaching labs are constructed of flammable material, in violation of codes, and cannot provide minimum fume capture velocities required for adequate fume removal. While the main water chiller was replaced, the existing (original) cooling tower is undersized for this chiller, and needs to be replaced.

Overall, the majority of the HVAC and electrical equipment serving the building has passed its expected useful serviceable lifespan. Consequently, this study recommends and includes complete replacement of the heating, ventilation and air conditioning systems. Because the building is so heavily scheduled, the recommended replacement HVAC system is fabricated off-site, in order to greatly reduce the interruption in service to the laboratory spaces. However, the extent of the HVAC system replacement work, plus the associated replacement of lab hoods, casework, and finishes requires that the lab portions of the building remain out of service for at least six (6) months.

Fire Protection
The Burson Building does not have an automatic fire protection (sprinkler) system. Any significant building renovations will require compliance with current building fire and life safety standards. The most practical way to meet these standards is to ensure that the building is fully protected by a modern fire sprinkler system. In addition, a fire suppression system is prudent and recommended primarily because of the higher fire risk inherent in this type building.

Electrical
The building stand-by power system is not adequate to support the building research functions, having insufficient capacity to support long-running experiments, maintain safe lab hood conditions, or maintain samples under proper storage conditions when utility power fails. The building power delivery system (main switchboards, especially) are also obsolete, and the building does not have an adequate information technology system or security network. Building lighting is also obsolete and requires replacement, which will return its cost in energy savings.

Plumbing

The building plumbing and laboratory piping systems is generally in good condition however, renovations and upgrades are required. Specifically, toilets will have to be reconfigured to meet current accessibility requirements. To serve the laboratories, a new recirculating demineralized water supply system is required. A new vacuum pump and local piping are also required to serve new and/or renovated labs.

2. Facility Program

General

With the exception of a few chemistry teaching lab functions, the Burson Building currently accommodates the balance of all teaching labs, research labs, faculty offices, and administrative offices for the Department of Chemistry and some teaching labs and administrative offices for the Physics Department. In addition, several University classrooms exist in Burson that are predominately used by the Chemistry Department.

Currently, the Chemistry Department occupies approximately 67,500 net square feet (nsf) in Burson. The Physics Department occupies approximately 14,000 nsf and 2,000 nsf is assigned to the maintenance shops. To meet the 2015 programmatic goals for the Chemistry Department, an additional 37,000 nsf is needed. Physics can reduce their footprint (in Burson) by 2,350 nsf and the shops can be reduced by as much as 1,100 nsf. In summary, Burson currently has 83,500 nsf and approximately 117,000 nsf is needed in order to meet the Chemistry Department's requirements.

Furthermore, the existing teaching and research laboratories in Burson have significant ventilation deficiencies and the majority of the air handling equipment serving the building has reached or is nearing its useful serviceable lifespan. This study includes the recommendation of a complete replacement of the heating, ventilation and air conditioning systems.

Chemistry

Based on the need to hire research-active faculty and to meet enrollment demands at the undergraduate and graduate levels, the Chemistry Department will completely run out of space within the next 2 years. The Department currently does not have the space needed to hire senior-level faculty. The Burson Building will not be able to support the teaching and research mission of the Chemistry Department in the near future. The Burson Building currently does not have the space needed to hire additional senior-level faculty and the ability to increase enrollment in the undergraduate and graduate levels courses is extremely compromised by the lack of additional area.

Regarding instructional space, most options to utilize existing teaching labs have already been used. Burson 201, 205 and 207 are already used from 8:00 AM – 10:30 PM Mondays through Thursdays (with the exception of 7:30 – 10:30 PM on Thursdays) and 8:00 – 11:00 AM on Friday mornings. Three additional sections could be added on Thursday evenings. Additional section cannot be added at 11:00 AM on Fridays due to teaching Graduate Teaching Assistant training conflicts at this time.

Burson 213 and 217, used for teaching Organic Chemistry laboratory (CHEM 2131L, 2132L), are also near capacity. Further, enrollments in 1000 and 2000 level laboratories at 32 students exceed the recommended maximum of 25 students recommended by the American Chemical Society (ACS) the organization that certifies the Department's Chemistry B.S. degrees. Occupancies in the large lecture halls including Burson 110 (185 seats) and Burson 115 (97 seats) are at capacity and CHEM 1203 and one section of CHEM 1251 are already being taught in other buildings (CHHS and Denny) because adequate space is not available to offer these sections in Burson.

Available research space is severely limited with only a small area remaining for new faculty hires. Burson 233, 167, 158, and 159 are available that is sufficient space for two to three new faculty, provided that appropriate renovations are made in other parts of the building. However, additional fume hoods are required in order to use these areas for research. Due to the lack of fume hoods, Burson 241 is currently underutilized and will require additional hoods to be more useable. Burson 243 and possibly 202 will also require additional hoods if they were to be used for research. Burson 202 is also being considered as possible space to be used for 2000 level organic chemistry laboratory courses.

Physics

Existing area in Burson Building occupied by the Physics department can be reduced. In particular, the area currently used for Physics Administrative offices is underutilized and teaching lab are can be reduced if the Astronomy Teaching lab is relocated to another building as is currently planned.

A chart below summarizes the existing and proposed net square feet (NSF)

		Existing	Proposed
Chemistry			
	Administration	1,178	1,210
	Teaching Labs	28,599	48,940
	Research Labs	37,669	54,257
Physics			
	Administration	2,371	1,043
	Teaching Labs	11,787	10,765
Shared			
	Shops	2,081	965
	Totals	**83,685**	**117,180**

3. Proposed Improvements

To accomplish the replacement of the existing mechanical and electrical systems and equipment, occupants will require a phased relocation. This feasibility study includes two options with Option 1 including the temporary relocation of portions of the Chemistry and Physics department utilizing pre-engineered modular buildings and Option 2 including a permanent addition on the site of the existing Burson Building parking lot. Option 1 would not provide the expansion area required by the Chemistry Department.

Both options include architectural modifications to the labs, lab support spaces such as the stock room, administrative offices, and some classroom modifications. Both options include replacement of all auxiliary fume hoods with new fume hoods compatible with a new variable -air-volume make-up air system. Both options would include the complete replacement of the existing mechanical and electrical systems and equipment, including additional stand-by power capacity, modifications to the existing plumbing systems as required by lab modifications, and a new automatic fire-protection system.

4. Project Schedule &Phasing

Option 1

Option 1 is estimated to require 36 months to complete. In Option 1, the program needs for the Chemistry Department would be prioritized with the teaching labs receiving most of the square footage that can be made available in the building. The mechanical, electrical and plumbing systems would be replaced and a fire protection system added to fully sprinkler the building. The major phases are proposed to achieve the renovations are as follows:

Phase 1 – Site Prep for pre-engineered modular units
Phase 2 – Install pre-engineered modular units. Relocate 2nd floor occupants to modular units
Phase 3 – Renovate 2nd floor and re-occupy
Phase 4 – Relocate 1st floor occupants to modular units
Phase 5 – Renovate 1st floor and re-occupy
Phase 7 – Complete renovations for final uses

Option 2

Option 2 is estimated to require 48 months to complete. This option includes renovations to the existing building and a two story addition on the Burson Building parking Lot on Craver Road. The addition offers significant swing space opportunities during construction which can eliminate the need for temporary modular units. The major phases are proposed to achieve the renovations are as follows:

Phase 1 - Relocate utilities, move transformers, cooling tower etc.
Phase 2 - Construct the addition, provide spaces for temporary use
Phase 3 - Relocate 2nd floor occupants to the addition
Phase 4 - Renovate Burson 2nd floor and re-occupy
Phase 5 - Relocate 1st floor occupants to addition (summer shut-down of lecture rooms)
Phase 6 - Renovate Burson 1st floor and re-occupy
Phase 7 - Complete renovations and construction of addition for final uses

5. Estimated Construction Costs

The cost for Option 1, which includes the temporary modular units, is in a range estimated between $49 million and $58 million. The cost for Option 2, which includes providing spaces in the addition for temporary use, is in a range estimated between $70 million and $81 million.

End of Section

Section 3
Approach

3.0 Approach

To execute this study, the following approach was used:

- Review and documentation of the existing facilities layout & usage, HVAC, infrastructure, and compliance with current NC building codes.
- Meetings with end users to determine current and future needs of the Chemistry and Physics Departments.
- Development and evaluation of proposed alternates for renovation and/or expansion of the existing facility to meet the determined current and future demands of the end users.
- Evaluation and analysis of the existing facilities including overall conditions of HVAC, building infrastructure and exterior, and code compliance.
- Preparation of graphic layouts of proposed alternate recommendations for renovations and/or expansion to meet the needs of the end users. These alternatives include phasing and costs associated with each alternate and phase.

The overarching goal is to renovate the Burson Building in a manner that will ensure that the Chemistry Department has the quantity and type of space it needs to hire additional research-active faculty and to fulfill its research and teaching objectives until the new science building is constructed.

Based on the need to hire research-active faculty and to meet enrollment demands at the undergraduate and graduate levels, the Chemistry Department will have no available space for growth within the next two years. Also, the Department currently does not have the space needed to hire senior-level faculty. Some specific shortcomings determined previously are:

1. Mechanical, Electrical, Plumbing including Fire Protection (MEP) Upgrades- According to a report prepared by the Chemistry Department dated August 22, 2012, infrastructure or MEP Upgrades are required for the following systems and equipment:
   a. Standby Power
   b. 500 Ton Chiller
   c. Make up air
   d. Outside air heat exchanger
   e. “Doghouse” hood exhaust enclosure
   f. Wireless Networking
   g. Card reader access
   h. Signage

2. Functional Renovations- according to the August 22, 2012 report, functional renovations are required for the following:
   a. Modifications to and additional teaching lab space

b. Additional lecture hall/classroom space
c. Modifications to and additional research lab space
d. Renovations to the Chemistry Stockroom
e. Dedicated space for receiving
f. Dedicated space for preparation of materials for teaching labs
g. Secure area for hazardous waste storage
h. More space for storage of flammable chemicals
i. New large autoclave
j. Biochemistry equipment room upgrades
k. Replace/refurbish the built- in drying ovens in research labs
l. Redesign the main Chemistry Office
m. Provide a break room

End of Section

Section 4
Existing Conditions Assessment and Recommendations

4.0 EXISTING CONDITIONS ASSESSMENT and RECOMMENDATIONS

Following are noted issues associated with the Burson Building, along with recommendations for improvement. As noted elsewhere in this report, two options have been described in this study including:

Option 1 - Renovations to Burson Building

Option 2 - Expansion and Renovation to Burson Building

Site, Structural and Architectural:

Site
There are negligible impacts to the site associated with Option 1. Option 2 conditions and recommendations follow.

The new addition will replace the existing parking lot (Lot #15) to the north of Burson along Craver Road. Twelve handicapped parking spaces currently exist in this lot and will need to be replaced in a nearby location (to be determined). A combination of concrete steps and ramps will be needed at the entry to the new addition. The first floor is approximately five to six feet above grade at that location. Vehicle access will be needed at the northeast corner of the addition for deliveries. Although a full loading dock is not needed, small delivery trucks are anticipated. Double doors to a receiving area are to be provided.

The existing sidewalk along Craver Road will need to be replaced, and demolition of the asphalt for Lot #15 will be required. Addition of sod in the previous asphalt areas not under the Burson Annex footprint, as well as landscaping, will be needed.

Condition Stabilization for Existing Building Structural/Architectural Components
An array of items requiring prompt attention was found during Stantec's site visit on June 18, 2013. These require prompt action to prevent further deterioration of the building, and these repairs are needed regardless of whether the building is renovated or expanded. Appendix C to this report contains more detailed explanation of the observed defects, and this Appendix includes extensive photographs of the conditions and a key plan which references each photograph's location. The observed building deficiencies include, but are not limited to cracked/displaced brick veneer, severely deteriorating joint sealants, deteriorated exterior stairways, cracked slabs on-grade in the vicinity of the loading dock, displaced window framing, leaking from the outside of the building, deteriorated interior joint sealants, cracked interior floor finishes, isolated cracked interior masonry walls, and a leaking roof.

Regarding the roof, this area contains miscellaneous equipment, equipment platforms, exterior duct work, parapets, and mechanical unit enclosures which are covered with translucent skylight panels. Water ponds exist on isolated areas of the roof. Sharp foreign debris was observed on the roof. Skylight mechanical enclosures leak as a result of deteriorated joint sealants, deteriorated framing, and loose framing resulting in water damaged interior finishes.

The items above need to be addressed to maintain the structural integrity, as well as extend the useful life of the building. An itemized cost opinion for the recommended repairs was not prepared. Instead, an allowance of $470,000 ($4.55 per square foot) is included for this work as a line item in the Opinion of Probable Construction cost, which is included in Appendix B.

Architectural

Exterior systems

The existing brick exterior and aluminum framed windows are to remain (with repairs). Extensive HVAC work is expected on the roof and complete roof replacement is anticipated. The new roof is to be 60 mil, PVC with sloped insulation.

Interior Partitions

Most of the existing interior walls are concrete masonry units (CMU) and will remain as-is. If modifications are required, the intent is to patch with matching CMU to the greatest extent possible.

Finishes

The architectural finishes in the existing building will generally remain except all ceilings will be replaced due to the extent of the mechanical, electrical and plumbing system work required above the ceilings. The new ceilings will match the existing ceilings that are generally lay-in ceilings.

Laboratory Casework

The existing wood laboratory casework is generally in fair condition and can remain.

Laboratory Countertops/Sinks

The existing laboratory countertops can remain with the exception of those located at the existing fume hoods and at the student stations (islands) in the teaching labs.

Laboratory Fume Hoods

The existing laboratory fume hoods are auxiliary air type hoods that no longer provide adequate ventilation. Replacement is recommended. The existing fume exhaust devices at the student stations in the 2nd floor teaching labs are custom made wood enclosures that are of flammable construction and therefore violate basic safety codes. Also, they do not provide ventilation which is adequate to reasonably ensure fume capture and a past upgrade of the lab exhaust system did not correct this. Therefore, replacement of the student hoods is required and is also recommended.

Mechanical, Electrical, Plumbing, and Fire Protection Systems

The existing mechanical (heating, ventilating, and air conditioning), electrical, plumbing, and fire protection systems cannot adequately support either the current building use or anticipated growth. Overcoming these deficiencies requires the following changes.

Mechanical- Heating, Ventilating and Air Conditioning (HVAC)

A complete HVAC system redesign and replacement is needed to reasonably ensure overall building occupant safety, and to adequately support the laboratory areas which are critical to both research and chemistry teaching. The current exhaust and supply air systems serving the teaching and research laboratories are antiquated and do not ensure occupant safety within the normal range of building operating conditions. In addition, acceptable comfort conditions cannot be consistently maintained throughout the building, due largely to the building-wide influence of the exhaust and make-up air systems. While significant improvements have been made through two previous major system upgrades, serious operating deficiencies remain. This is due primarily to limitations inherent in the original design. Though the laboratory exhaust system design was typical at the time Burson was built, codes and standards are now more stringent and design practices have evolved. Also, much of the equipment is original and is well past its expected life. Consequently, current laboratory standards and HVAC system best practices are unlikely to be achieved by any reasonable degree of modification to the current HVAC system.

In addition, there is insufficient capacity available in the existing HVAC systems to either meet current nominal requirements, or to serve the new teaching and research labs which are required to meet the building's programmatic mission outlined in Section 5.

Replacing the existing HVAC system requires that essentially the entire 2nd floor of the building must be vacated during the replacement work. A phased replacement is not practical because of the interconnected nature and dispersed configuration of the existing equipment, ductwork, and controls. Burson's labs are now heavily scheduled, and there are no adequate temporary lab facilities either on campus or within a reasonable distance. Consequently, temporary facilities costs associated with the required HVAC system replacement are much less if Burson is first expanded with new labs, then the 2nd floor labs are vacated and renovated.

Also, a new freight elevator will be required for adequate maintenance and replacement access to the new main HVAC equipment, much of which must be located at the current roof level. This freight elevator is required whether or not Burson is expanded.

Plumbing

Building plumbing and laboratory support piping systems require less work than the HVAC, fire protection, or electrical systems. However, renovations and upgrades are required. Specifically, toilets will have to be reconfigured to meet current accessibility requirements. To serve the laboratories, a new recirculating demineralized water supply system is required. A new vacuum pump and local piping are also required to serve each pair of new or renovated labs.

Fire Protection

The current building has no automatic fire protection (sprinkler) system. The required building renovations are of such an extent that compliance with current building fire and life safety standards will be required. The most practical way to meet these standards is to ensure that the building is fully protected by a modern fire sprinkler system. In addition, a fire suppression system is prudent and recommended primarily because of the higher fire risk inherent in this type building.

Electrical

Selected research currently carried out in the building, as well as research anticipated in the future requires an adequate stand-by electrical power system. No such system currently exists, requiring extraordinary measures to preserve samples, some equipment, and experiment results whenever normal power fails. In addition a proper information technology network is required throughout the building, since none now exists. Further, the existing building main power switchboard and panels are obsolete, and must be replaced in order to ensure reliable normal power. All existing building lighting systems are obsolete, well past their expected life, and their replacement will reduce energy costs enough to pay for the replacement. Finally, the building requires that a security system be installed to control both general building access and access to sensitive or potentially hazardous areas.

Probable Cost of the Recommended Work

The following Table summarizes Stantec's opinion of probable cost for Option 1, which includes renovation of the existing building, and for Option 2, which includes a building expansion to accommodate growth. Please note that these cost opinions include both scope and construction contingencies, as well as likely compensation for design services plus an allowance for Owner project administrative costs. The following aspects of these cost opinions are particularly noteworthy:

- For both Options 1 and 2, the Burson Building must be partially vacated during renovation. Since there is no extant suitable space on campus which can serve as temporary chemistry classroom space, temporary modular chemistry classrooms are required. The (very high) cost allocated to these temporary classrooms is:
    - Option 1: $11,800,000
    - Option 2: , $8,400,000

End of Section

Section 5
Facility Program Summary

5.0 FACILITY PROGRAM SUMMARY

Following is a facility program of requirements (PoR) that compares the existing net square feet (NSF) areas within Burson with program space needs.

	Existing Space (NSF)	Program Space (NSF)	
1.0 Chemistry Admin	1,178	1,210	
2.0 Chemistry Teaching	28,599	48,940	
3.0 Chemistry Research	37,669	54,257	Note: 2025 Projection
4.0 Physics Admin	2,371	1,043	
5.0 Physics Teaching	11,787	10,765	
6.0 Shops	2,081	965	
	83,685	**117,180**	

1.0 Chemistry Administration

Space Type		Existing Space				Program Space			
		Qty	Area	Total	Notes	Qty	Area	Total	Notes
Chemistry Administrative Space									
1.1: Office Areas									
1.1.1	Chemistry Chair Office	1	374	374	Exist Room 218	1	200	200	
1.1.2	Open office area	1	402	402	Exist Room 200	1	600	600	4 workstations plus receptionist
1.1.3	Secretary	1	110	110	Exist Room 200B				
1.1.4	Office	1	149	149	Exist Room 200A				
1.1.5	Conference Room					1	150	150	
SUBTOTAL: Office Area				**1,035 sf**				**950 sf**	
1.2: Office Support									
1.2.1	Mail slot area					1	60	60	
1.2.2	Work Room	1	143	143	Exist Room 200C	1	120	120	
1.2.3	Kitchenette					1	80	80	Sink, refrig, coffee
SUBTOTAL: Office Support				**143 sf**				**260 sf**	
Total Chemistry Admin:				**1,178 sf**				**1,210 sf**	

2.0 Chemistry teaching

		Existing Space				Program Space			
	Space Type	Qty	Area	Total	Notes	Qty	Area	Total	Notes
Chemistry Teaching									
2.1: Chemistry Lecture									
2.1.1	200 Person Lecture Hall					1	3,750	3,750	
2.1.2	Chemistry Lecture Lab	1	2,245	2,245	Exist Room 110	1	2,304	2,304	Combine 110 and 110A
2.1.3	Projector Room	1	59	59	Exist Room 110A				
2.1.4	Chemistry Lecture	1	1,371	1,371	Exist Room 115	1	1,371	1,371	
2.1.5	Chemistry Prep	1	244	244	Area in exist Room 117	1	244	244	
2.1.6	Conference Room / Kitchenette	1	1,300	1,300	Use remainder of exist Room 117	1	1,300	1,300	
2.1.7	Chemistry Lecture	1	668	668	Exist Room 118	1	668	668	
SUBTOTAL: Chemistry Lecture / Classroom				**5,887 sf**				**9,637 sf**	
2.2: Chemistry Lecture Support									
2.2.1	Break Room	1	259	259	Use exist Room 111	1	259	259	
2.2.2	Kitchenette	1	88	88	Use exist Room 112	1	88	88	
2.2.3	Conference Room	1	264	264	Exist Room 113	1	264	264	
2.2.4	Group Meeting / Study	1	584	584	Exist Room 119	1	584	584	
2.2.5	Conference Room	1	578	578	Exist Room 120	1	578	578	
2.2.6	Reading Room	1	712	712	Exist Room 237	1	712	712	
2.2.7	Computer Lab	1	1,096	1,096	Exist Room 239A	1	1,096	1,096	
2.2.8	Chemistry Resource Room	1	1,211	1,211	Exist Room 239B	1	1,211	1,211	
2.2.9	Multiplex Room	1	117	117	Exist Room 239C	1	117	117	
2.2.10	Storage	1	222	222	Exist Room 239D	1	222	222	
SUBTOTAL: Office Area				**5,131 sf**				**5,131 sf**	
2.3: Chemistry Teaching Labs									
2.3.1	Biochemistry Teaching Lab	1	945	945	16 students, existing room 173	1	945	945	Keep existing Biochem Lab
2.3.2	P-Chem, Instrument, Analysis	1	1,251	1,251	Exist rooms 137, A, B, C, D	2	1,089	2,178	24 students ea
2.3.3	General Chemistry Teaching Labs	3	1,113	3,339	Exist rms 201, 203, 205 (28 students)	8	1,089	8,712	24 students ea
2.3.4	Organic Chemistry Teaching Labs	2	1,042	2,084	Exist rooms 213, 217 (28 students)	3	1,089	3,267	24 students ea
2.3.5	Quantitative Chemistry Teaching Labs	1	1,020	1,020	Exist room 211 (28 students)	1	1,089	1,089	24 students ea
2.3.6	Inorganic, Structures Chemistry Teaching Labs	1	1,677	1,677	Exist room 202 (28 students)	1	1,089	1,089	24 students ea
SUBTOTAL: Labs				**10,316 sf**				**17,280 sf**	
2.4: Chemistry Teaching Lab Classrooms									
2.4.3	General Chem Teaching Lab Classrooms	3	528	1,584	Existing rooms 201, 205, 207	8	726	5,808	22' x 33'
2.4.4	Organic Chem Teaching Lab Classrooms	2	528	1,056	Existing rooms 213, 217	3	726	2,178	22' x 33'
2.4.5	Quantitative Chem Teaching Lab Classroom	1	528	528	Existing room 211	1	726	726	22' x 33'
SUBTOTAL: Classrooms				**3,168 sf**				**8,712 sf**	
2.5: Chemistry Teaching Lab Instrument Rooms									
2.5.3	General Chem Teaching Lab Instrument Rms	2	308	616	Existing rooms 203, 207	8	363	2,904	11' x 33'
2.5.4	Organic Chem Teaching Lab Instrument Rm	1	408	408	Existing room 215	3	363	1,089	11' x 33'
2.5.5	Quantitative Chem Teaching Lab Instrument Rm	1	187	187	Existing room 209	1	363	363	11' x 33'
SUBTOTAL: Instrument Rooms				**1,211 sf**				**4,356 sf**	
2.6: Chemistry Support Spaces									
2.6.1	Lab Manager	1	115	115	Exist Room 219	1	115	115	
2.6.2	Stock Room Dispensing	1	501	501	Exist Room 221	1	1,000	1,000	Combine 221, 208 and 223
2.6.3	Overflow Storage	1	494	494	Exist Room 208				
2.6.4	Stock Clerk	1	107	107	Exist Room 221A	1	107	107	
2.6.5	Bldg Receiving / Office (old glass shop)	1	182	182	Exist Room 206	1	182	182	
2.6.6	Prep/Storage	1	155	155	Exist Room 223				
2.6.7	Stock Room Organic Stor	1	612	612	Exist Room 225	1	650	650	
2.6.8	Stock Room Inorganic Stor	1	720	720	Exist Rooms 225A	1	770	770	
2.6.9	Stock Room Dispensing					1	400	400	If additional labs in annex
2.6.10	Prep Room					1	600	600	If additional labs in annex
SUBTOTAL: Support				**2,886 sf**				**3,824 sf**	
Total Chemistry Teaching:				**28,599 sf**				**48,940 sf**	

3.0 Chemistry Research

	Space Type	Existing Space				2015 Projection			2025 Projection			
		Qty	Area	Total	Notes	Qty	Area	Total	Qty	Area	Total	Notes
Chemistry Research												
3.1: Office Areas												
3.1.1	Offices	29	115	3,335	9 on 1st floor, 20 on 2nd floor	20	110	2,200	30	110	3,300	10' x 11'
3.1.2	Office	1	163	163		1	163	163	1	163	163	
SUBTOTAL: Office Area				**3,498 sf**				**2,363 sf**			**3,463 sf**	
3.2: Research Labs												
3.2.1	1st Floor Existing Research Labs	1	5,683	5,683	16 labs							
3.2.2	2nd Floor Existing Research Labs	1	13,460	13,460	16 at 560SF ea, 3 at 1,000SF ea, 1 at 1,500SF							
3.2.3	Synthetic Research (80%)					16	1,331	21,296	24	1,331	31,944	
3.2.4	Analytical Research (20%)					4	1,331	5,324	6	1,331	7,986	
3.2.5	Dedicated Instrument Rooms					20	121	2,420	30	121	3,630	
SUBTOTAL: Labs				**19,143 sf**				**29,040 sf**			**43,560 sf**	
3.3: Support Spaces												
3.3.1	Lab Support Space - Common Instrument Rms					6	484	2,904	8	484	3,872	Based on 22'x22'
3.3.2	Lab Support Space - Laser Room	1	784	784	Exist Rms 156 & 156A							
3.3.3	Lab Support Space - Cold Room	1	57	57	Exist Rm 230							
SUBTOTAL: Support				**841 sf**				**2,904 sf**			**3,872 sf**	
3.4: Shared Core Space (accessible by all research labs)												
3.4.1	Core Space - Lab	1	386	386	Exist Rm 148	1	386	386	1	386	386	
3.4.2	Core Space - Regional Analytical Chemistry	1	386	386	Exist Rm 162	1	386	386	1	386	386	
3.4.3	Core Space - Micro Electronics Research Lab	1	374	374	Exist Rm 168	1	374	374	1	374	374	
3.4.4	Core Space - NMR	1	410	410	Exist Rm 227	1	410	410	1	410	410	
3.4.5	Core Space - Instrument Room/NMR	1	713	713	Exist Rm 231	1	713	713	1	713	713	
3.4.6	Core Space - Research Instrument	1	456	456	Exist Rm 245	1	456	456	1	456	456	
3.4.7	Graduate Student Office	1	187	187	Exist Rm 147	1	187	187	1	187	187	
3.4.8	Student Lounge	1	450	450	Exist Rm 235	1	450	450	1	450	450	
SUBTOTAL: Shared Core Labs				**3,362 sf**				**3,362 sf**			**3,362 sf**	
Total Chemistry Research:				**26,844 sf**				**37,669 sf**			**54,257 sf**	

4.0 Physics Admin

	Space Type	Existing Space				Program Space			
		Qty	Area	Total	Notes	Qty	Area	Total	Notes
Physics Administrative Space									
4.1: Office Areas									
4.1.1	Physics Chair Office	1	184	184	Exist Rm 100C	1	200	200	
4.1.2	Reception	1	343	343	Exist Rm 343	1	343	343	Include copier, files
4.1.3	Offices	4	107	428	Exist Rms 102-105				
4.1.4	Student Office	1	110	110	Exist Rm 90				
4.1.5	Offices	3	132	396	Exist Rms 164D, 164E, 164F				
4.1.6	Offices	1	205	205	Exist Rm 164G				
4.1.7	Open Office Area					1	200	200	4 cubicles
4.1.8	Open Office Area					1	300	300	6 faculty cubicles
SUBTOTAL: Office Area				**1,666 sf**				**1,043 sf**	
4.2: Office Support									
4.2.1	Copier	1	54	54	Exist Rm 100A				Included in reeption area above
4.2.2	Meeting Room	1	192	192	Exist Rm 100B				
4.2.3	File Room	1	66	66	Exist Rm 100D				Included in reeption area above
4.2.4	Passage	1	223	223	Exist Rm 185				
4.2.5	Corridor	1	170	170	Exist Rm 164H				
SUBTOTAL: Office Support				**705 sf**				**0 sf**	
Total Physics Admin:				**2,371 sf**				**1,043 sf**	

5.0 Physics Teaching

Space Type		Existing Space Qty	Area	Total	Notes	Program Space Qty	Area	Total	Notes
Physics Teaching									
5.1: Physics Lecture / Classroom									
5.1.1	Physics Resource Center	1	954	954	Exist Room 76	1	800	800	Can be a smaller than exist room
5.1.2	Physics Lecture	1	720	720	Exist Room 116	1	720	720	
5.1.3	Physics Lecture	1	2,340	2,340	Exist Room 121	1	2,478	2,478	Remove projector rm 121A, redesign seating
5.1.4	Projector Room	1	138	138	Exist Room 121A				
5.1.5	Storage (adjacent to Rm 76)	1	44	44	Exist Room 135H	1	44	44	
5.1.6	Vestibule (adjacent to Rm 76)	1	30	30	Exist Room 135G	1	30	30	
SUBTOTAL: Physics Lecture / Classroom				**4,226 sf**				**4,072 sf**	
5.3: Labs									
5.3.1	Astronomy	1	1,309	1,309	Exist Room 114	0	0	0	Move to Cameron or near observatory
5.3.2	Teaching Labs	4	1,138	4,552	Exist Rooms 131, 133, 151, 153 (note: 151, 153 to move out)	3	1,270	3,810	Size rooms for 30 students each Note: Op: 2 - 2 labs, 1 multi-purpose room
SUBTOTAL: Labs				**5,861 sf**				**3,810 sf**	
5.4: Lab Support Spaces									
	Astronomy Support					0	0	0	Move to Cameron or near observatory
	Teaching Labs Support					3	545	1,635	16'-6" x 33'
5.4.1	Physics Stock Room	1	530	530	Exist Room (can be smaller)	1	400	400	
5.4.2	Intro Lab Storage	1	193	218	Exist Room 132A, 48	1	193	218	
5.4.3	Intro Lab Storage	1	630	630	Exist Room 132/152	1	630	630	
5.4.4	Instrument Room	1	100	100	Exist Room 153A (not needed)				
5.4.5	Instrument Room	1	124	124	Exist Room 153B (not needed)				
5.4.6	Instrument Room	1	98	98	Exist Room 153C (not needed)				
SUBTOTAL: Support				**1,700 sf**				**2,883 sf**	
Total Physics Teaching:				**11,787 sf**				**10,765 sf**	

6.0 Shops

Space Type		Existing Space Qty	Area	Total	Notes	Program Space Qty	Area	Total	Notes
Shops									
6.1: Shops									
6.1.1	Electronics Shop	1	508	508	Exist Rm 146	1	508	508	
6.1.2	Electronics Shop	1	457	457	Exist Rm 170 - Confirm if required	1	457	457	
6.1.3	Instrument Shop	1	483	483	Exist Rm 171 (not needed)				
6.1.4	Maintenance Shop	1	633	633	Exist Rm 171A (not needed)				
SUBTOTAL: Shops				**2,081 sf**				**965 sf**	
Total Shops:				**2,081 sf**				**965 sf**	

End of Section

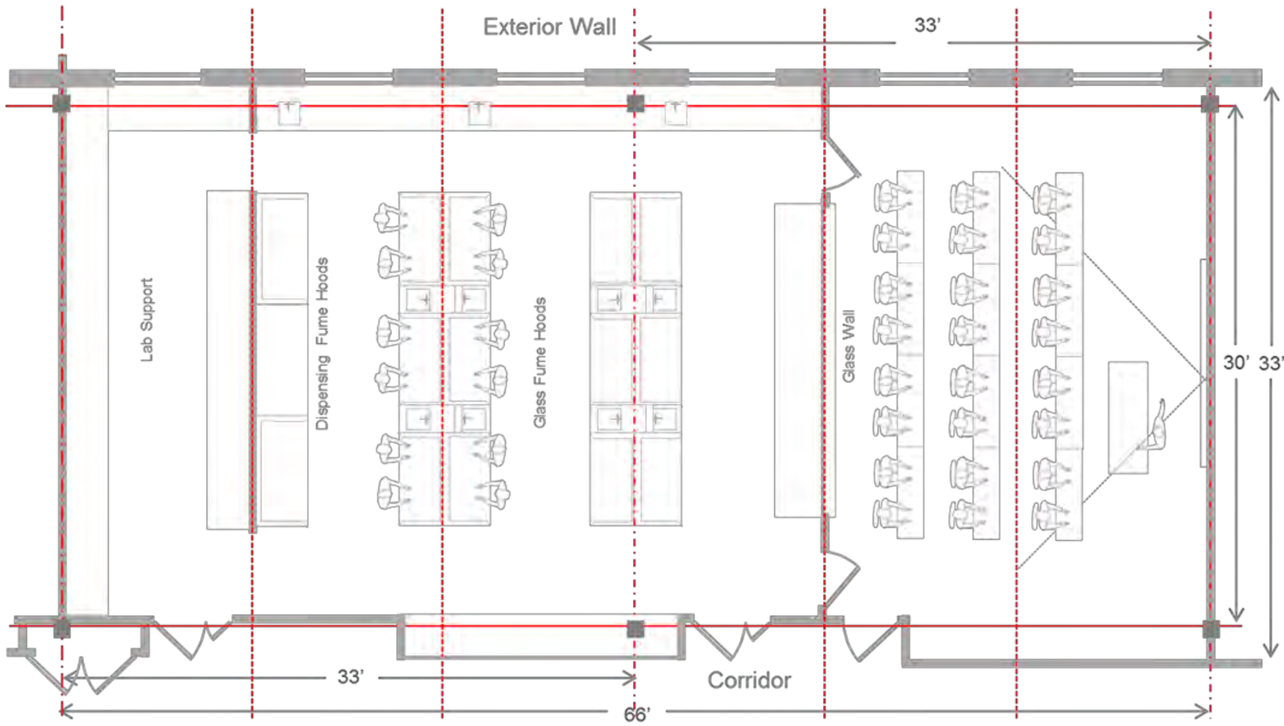
Section 6
Room Diagrams

6.0 ROOM & ADJACENCY DIAGRAMS

Room Diagrams

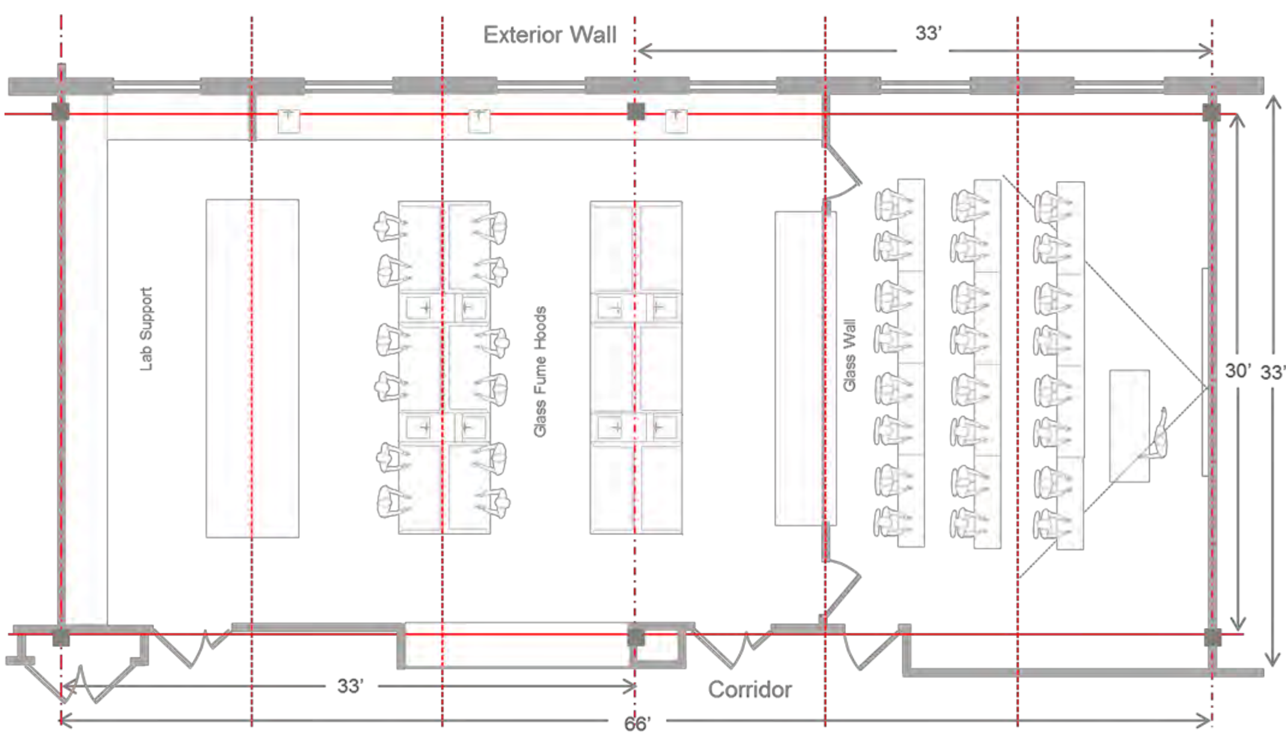
The following room diagrams, developed during the study, define the general room sizes and requirements. They are intended to provide a graphic basis for the area allocations. Final layouts may vary depending on specific locations in the building. The diagrams are separated into the following categories:

- Teaching Laboratories
- Research Laboratories
- Offices and Conference Rooms



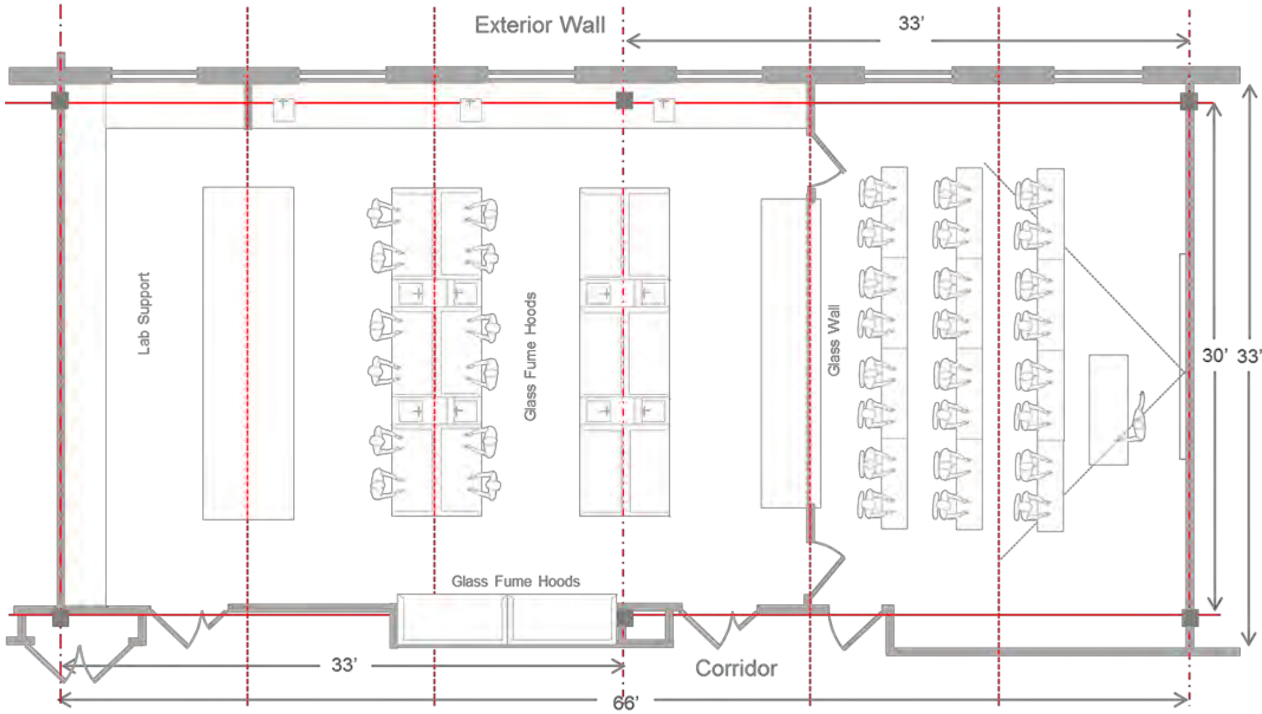
General Chemistry Teaching Lab Option 1
University of North Carolina at Charlotte
Burson Building

66' x 33' = 2,178 nsf



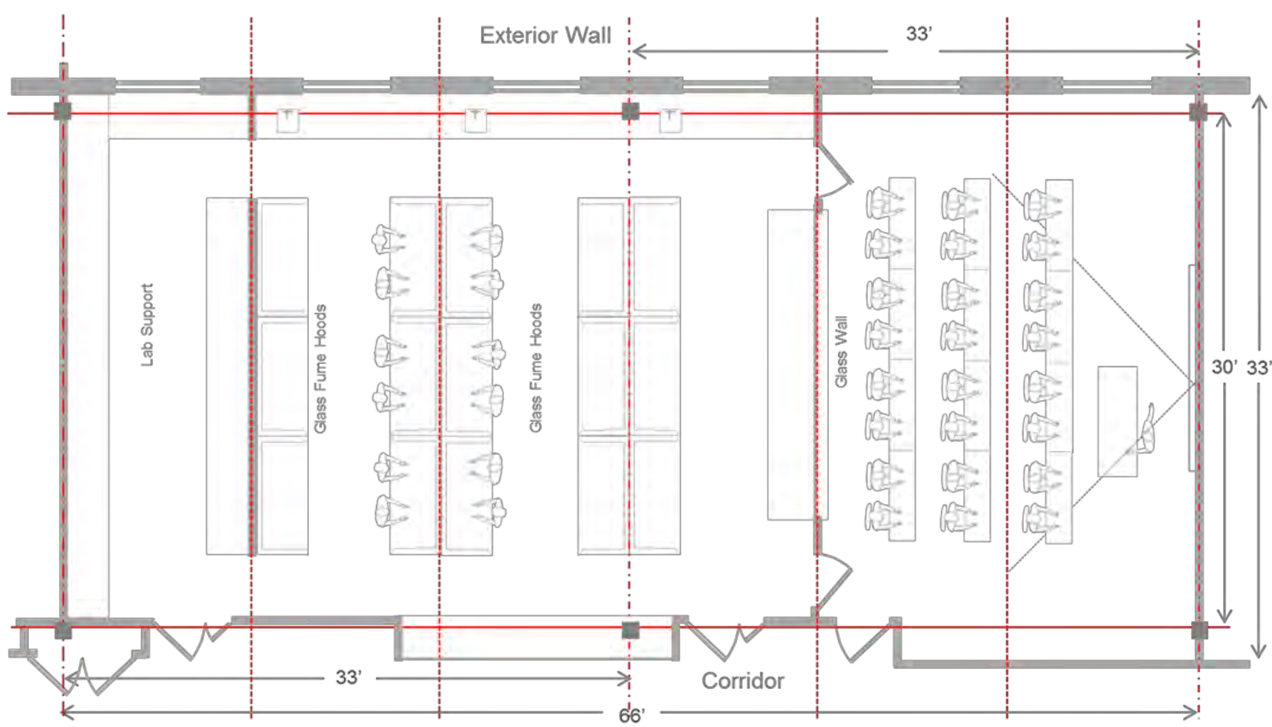
Gen. Chem. Teaching Lab Option 2- 24P
University of North Carolina at Charlotte
Burson Building

66' x 33' = 2,178 nsf



Gen. Chem. Teaching Lab Option 2- 28P
University of North Carolina at Charlotte
Burson Building

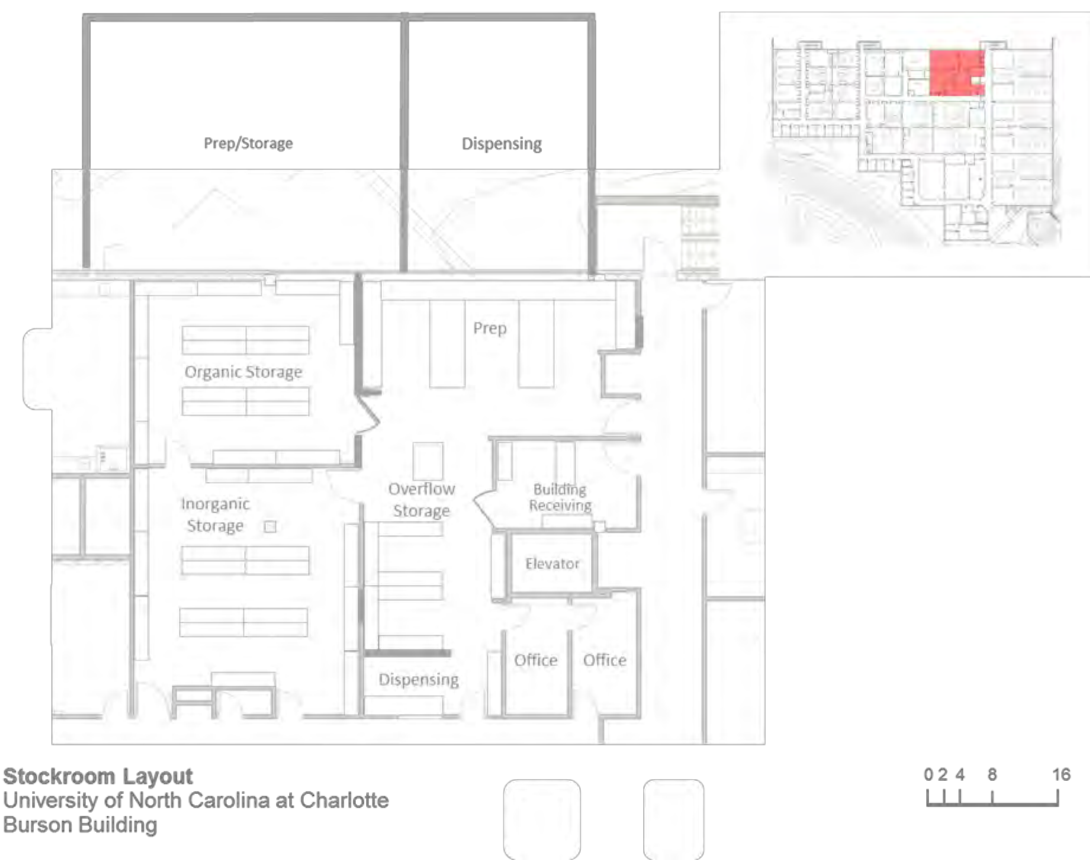
66' x 33' = 2,178 nsf



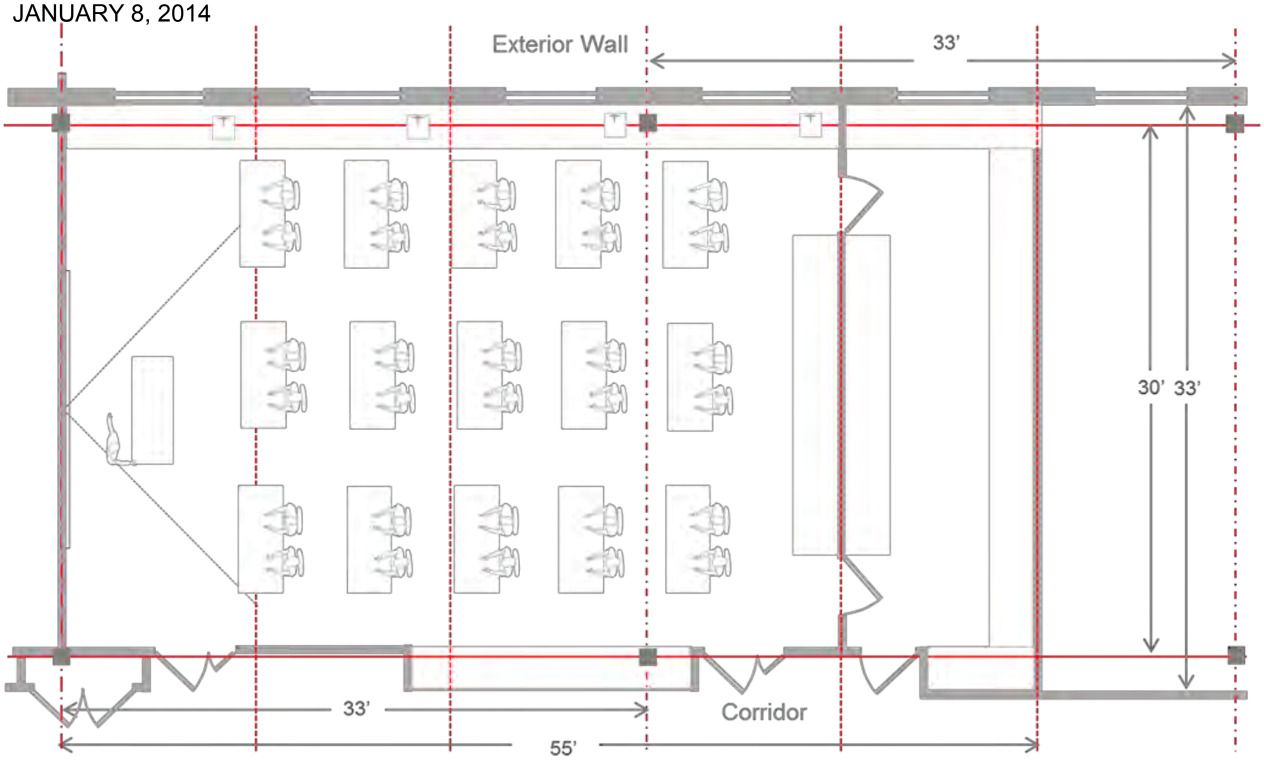
Organic Chemistry Teaching Lab
University of North Carolina at Charlotte
Burson Building

66' x 33' = 2,178 nsf

Quantitative Chemistry Lab Layout – Existing Rooms 170 & 171
University of North Carolina at Charlotte
Burson Building

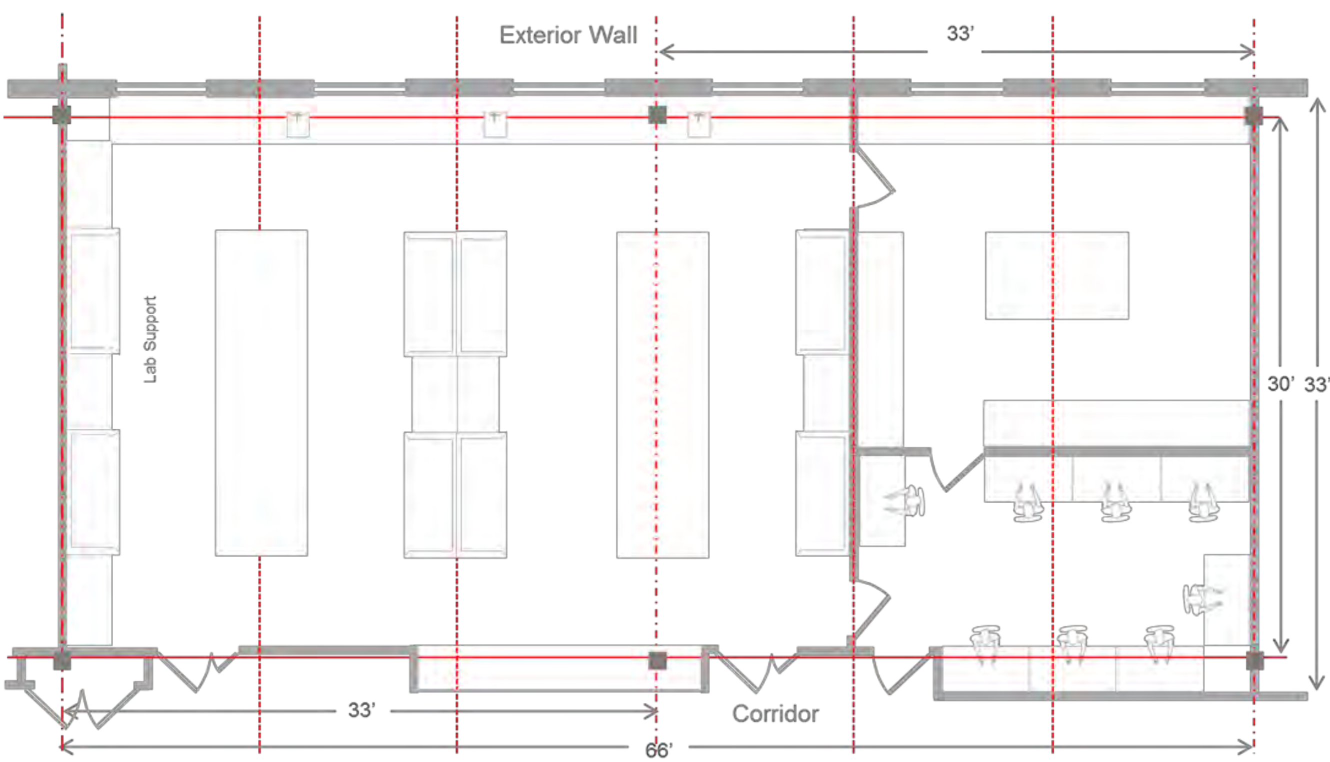


Stockroom Layout
University of North Carolina at Charlotte
Burson Building



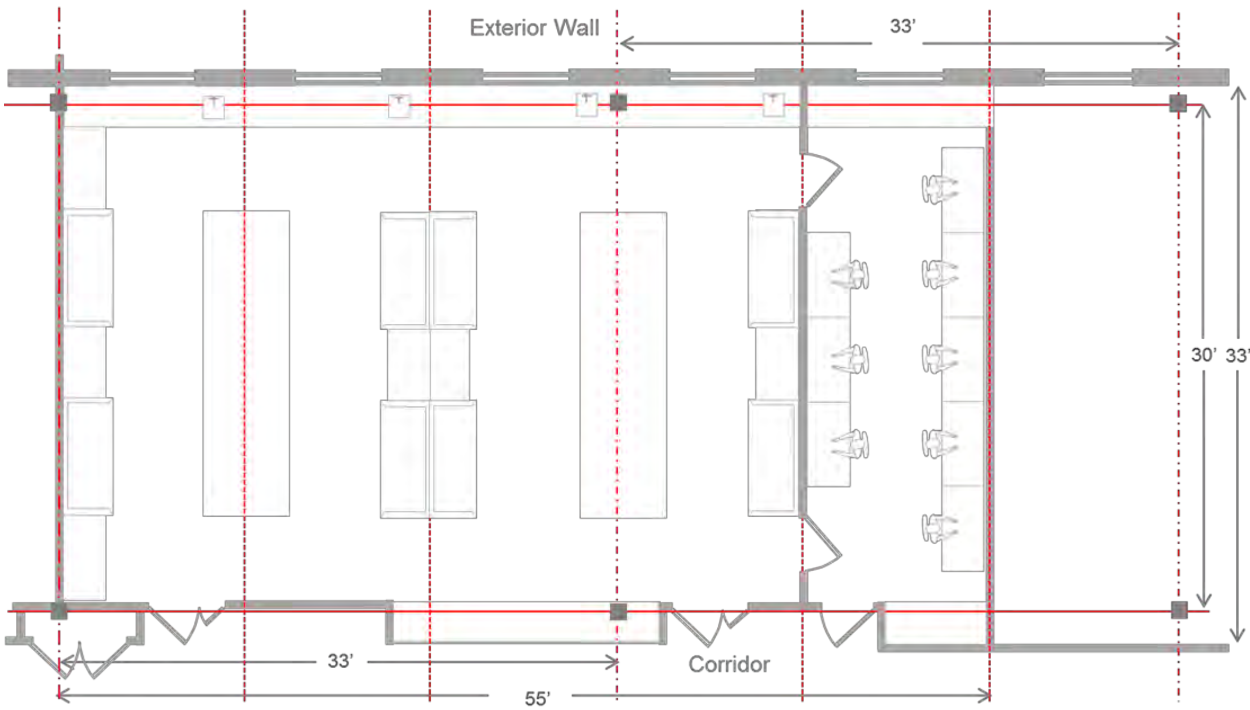
Physics Teaching Lab
University of North Carolina at Charlotte
Burson Building

55' x 33' = 1,815 nsf



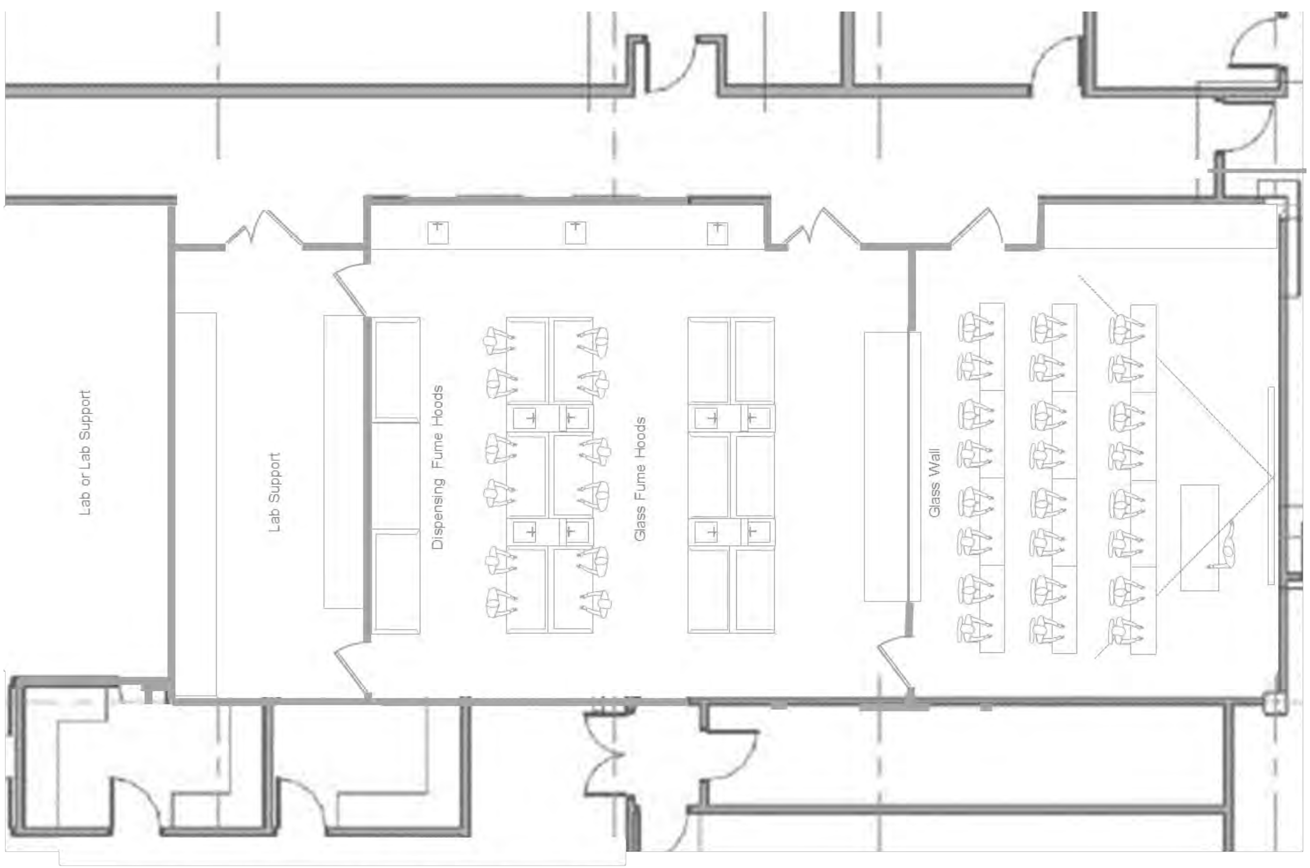
Chemistry Research Lab – Option 1
University of North Carolina at Charlotte
Burson Building

66' x 33' = 2,178 nsf

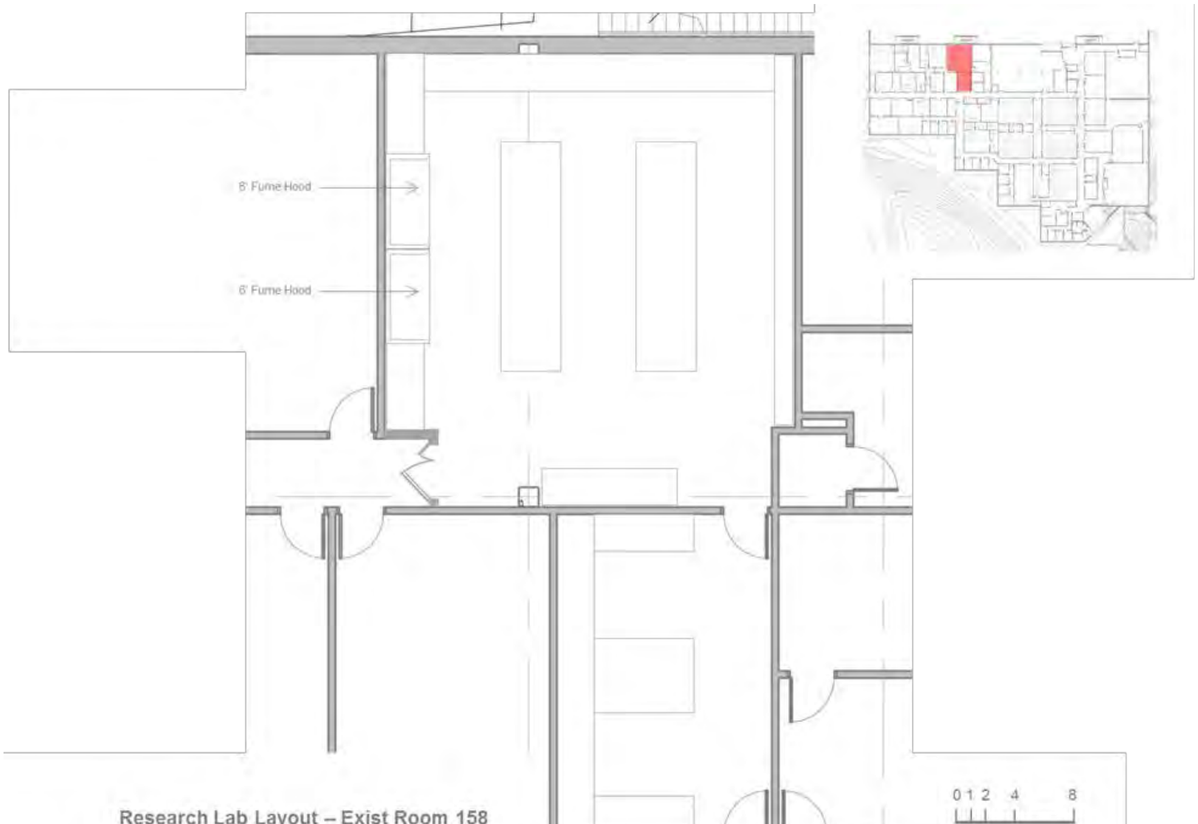


Chemistry Research Lab – Option 2
University of North Carolina at Charlotte
Burson Building

55' x 33' = 1,815 nsf



Gen. Chem. Teaching Lab – Existing Room 151, 152, 153
University of North Carolina at Charlotte
Burson Building



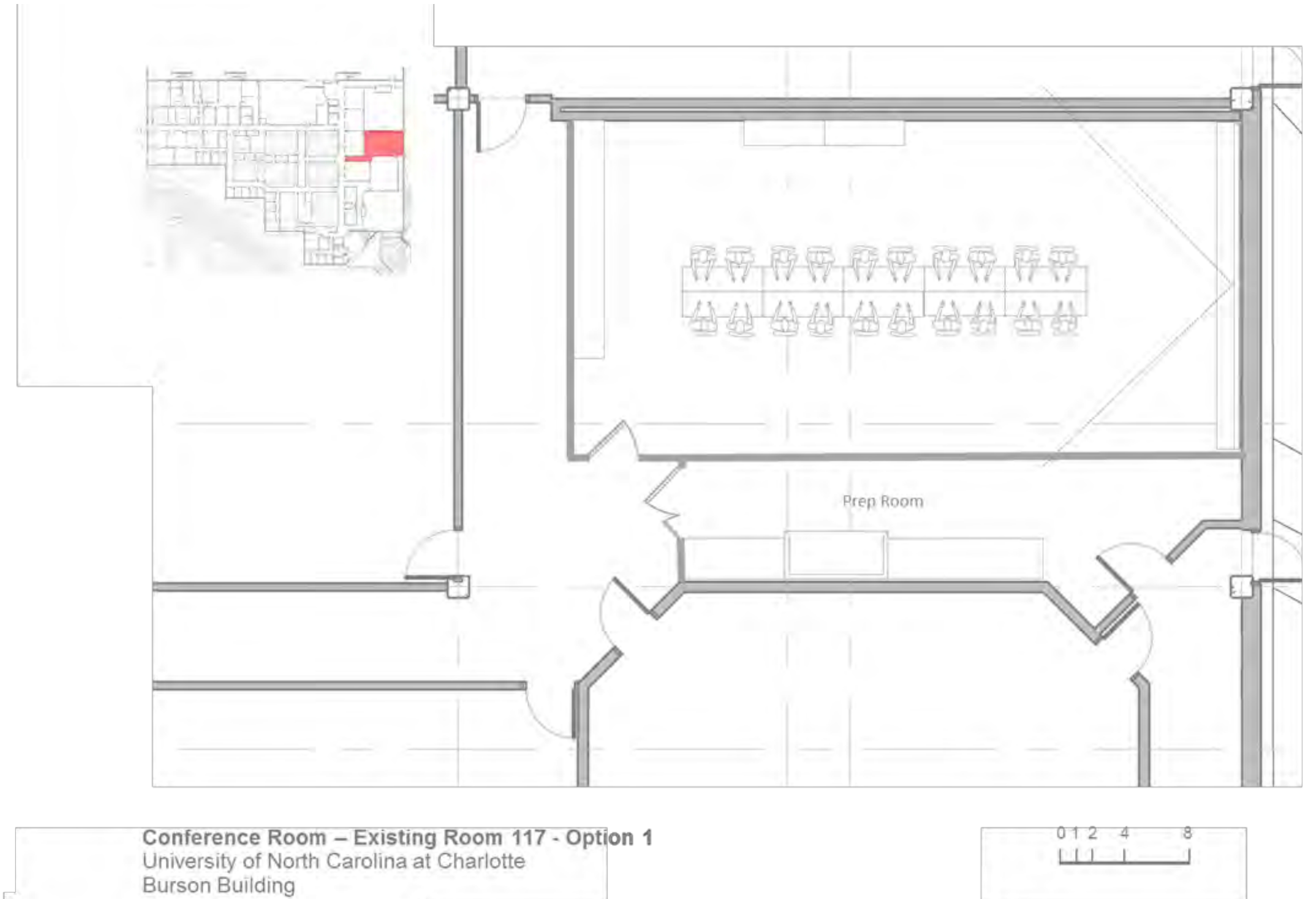
Research Lab Layout – Exist Room 158
University of North Carolina at Charlotte
Burson Building

Chemistry Admin Offices
University of North Carolina at Charlotte
Burson Building

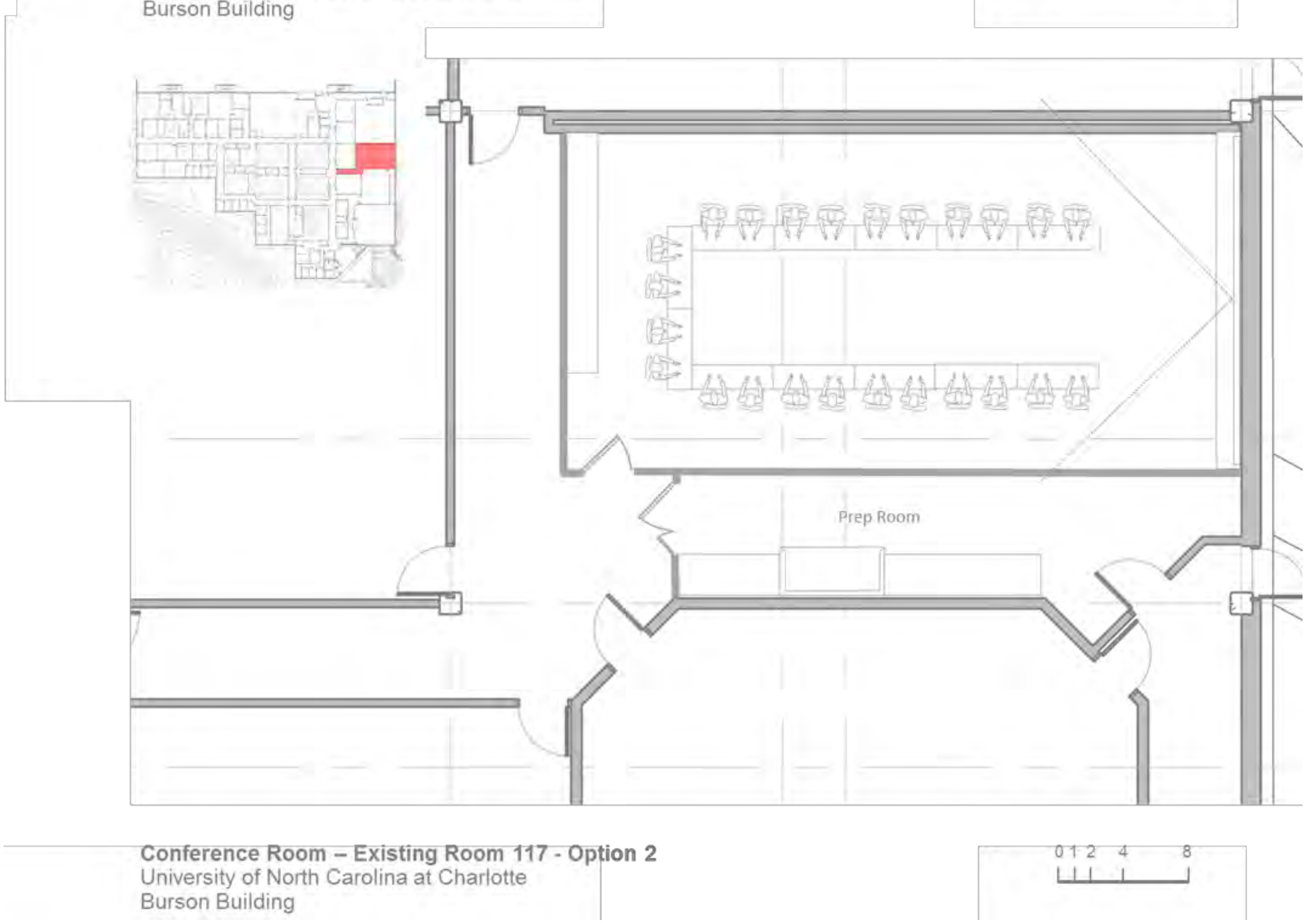
0 1 2 4 8

Physics Admin Offices – Option 1
University of North Carolina at Charlotte
Burson Building

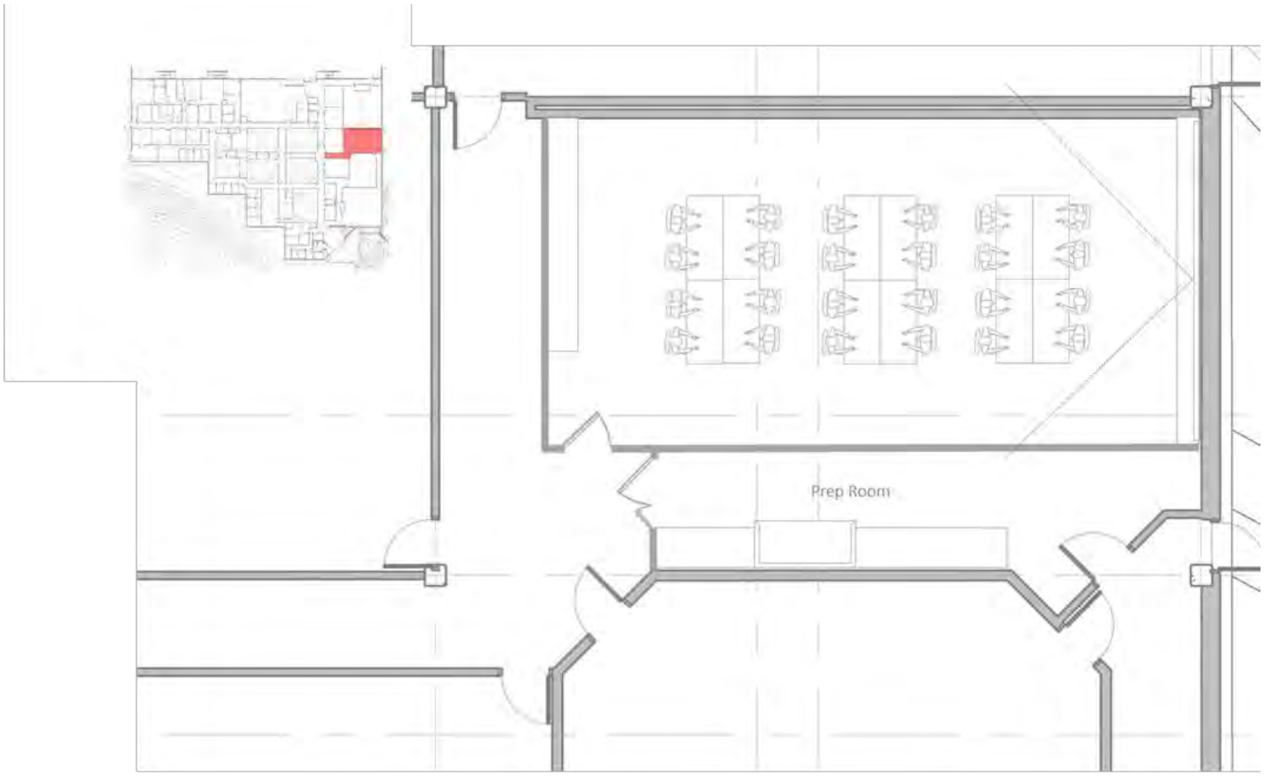
Physics Admin Offices – Option 2
University of North Carolina at Charlotte
Burson Building



Conference Room – Existing Room 117 - Option 1
University of North Carolina at Charlotte
Burson Building

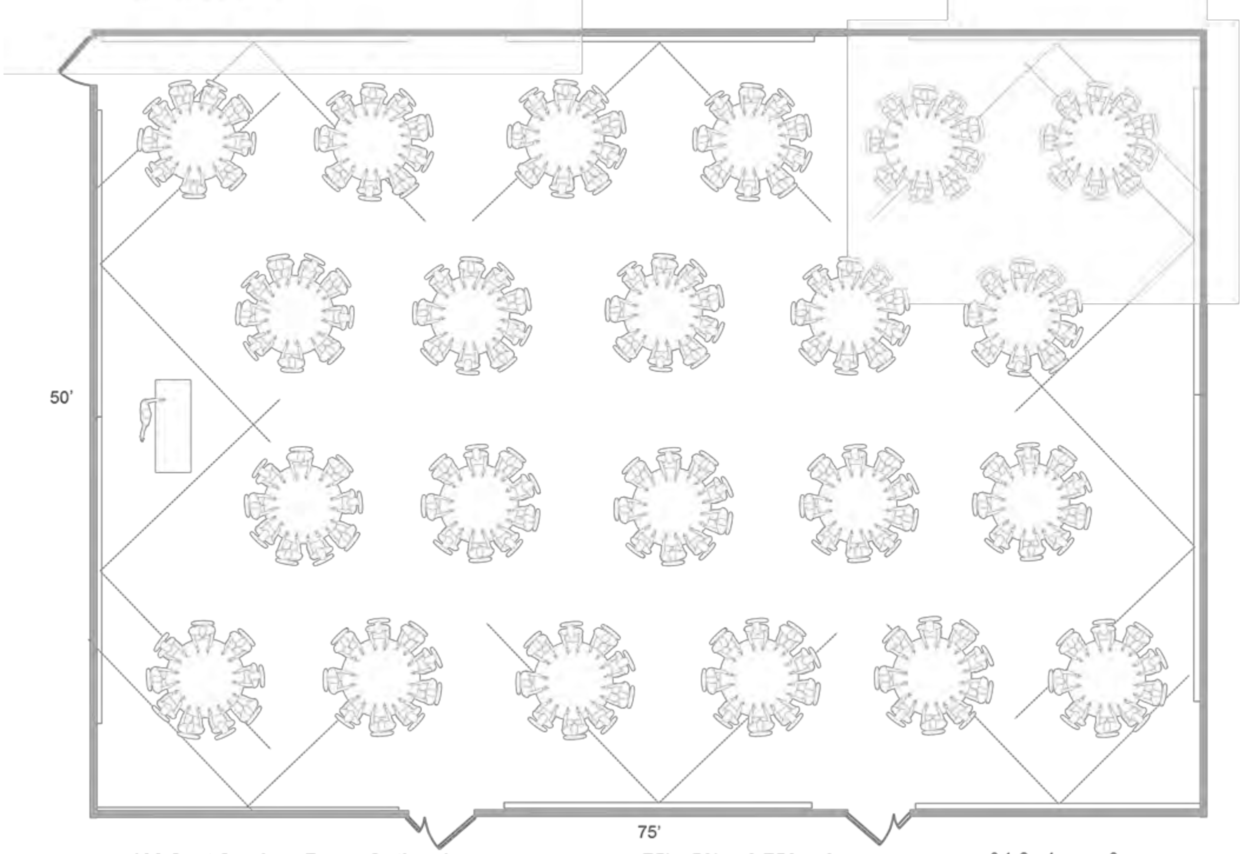


Conference Room – Existing Room 117 - Option 2
University of North Carolina at Charlotte
Burson Building



Conference Room – Existing Room 117 - Option 3
University of North Carolina at Charlotte
Burson Building

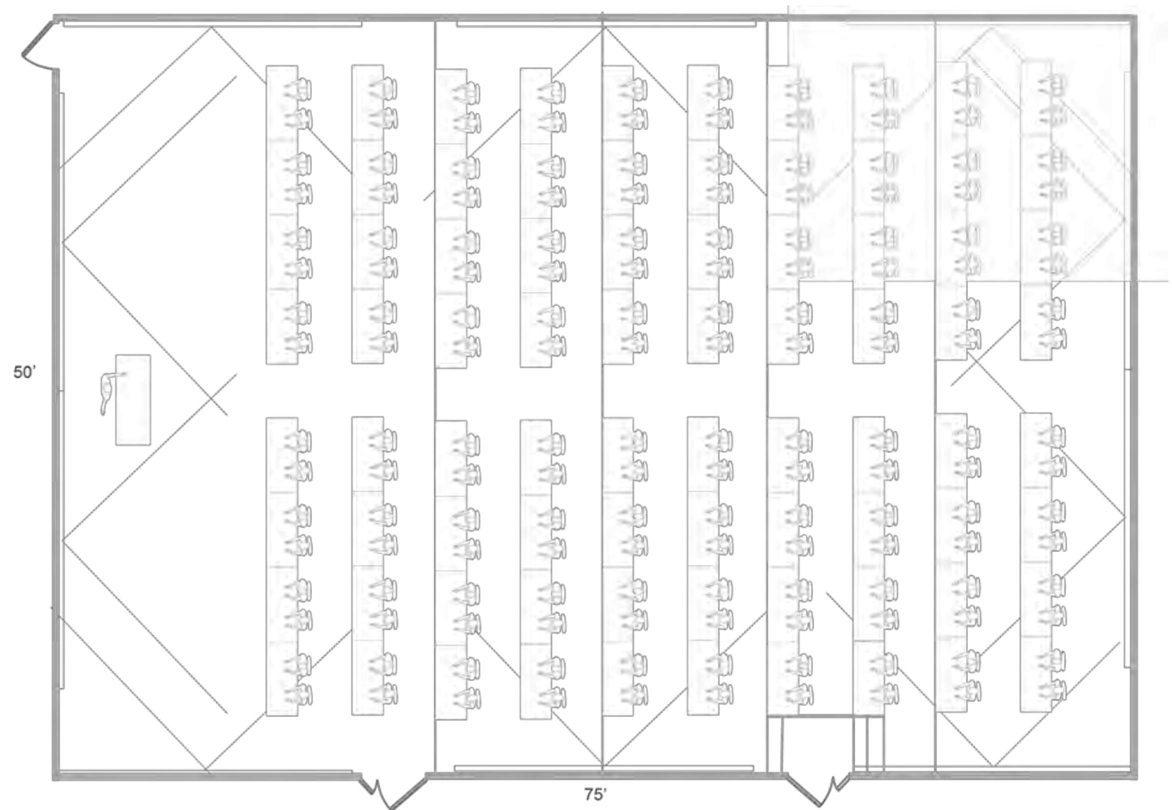
0 1 2 4 8



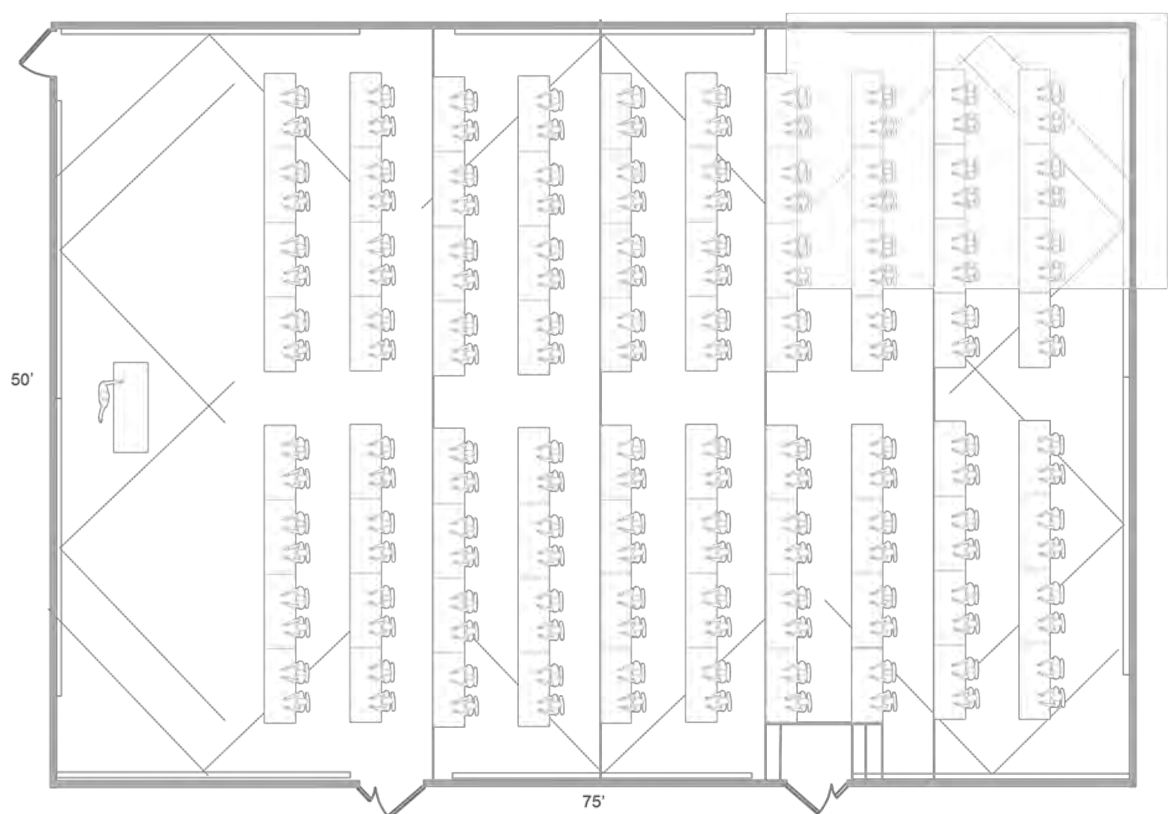
198 Seat Seminar Room Option 1
University of North Carolina at Charlotte
Burson Building

75' x 50' = 3,750 nsf

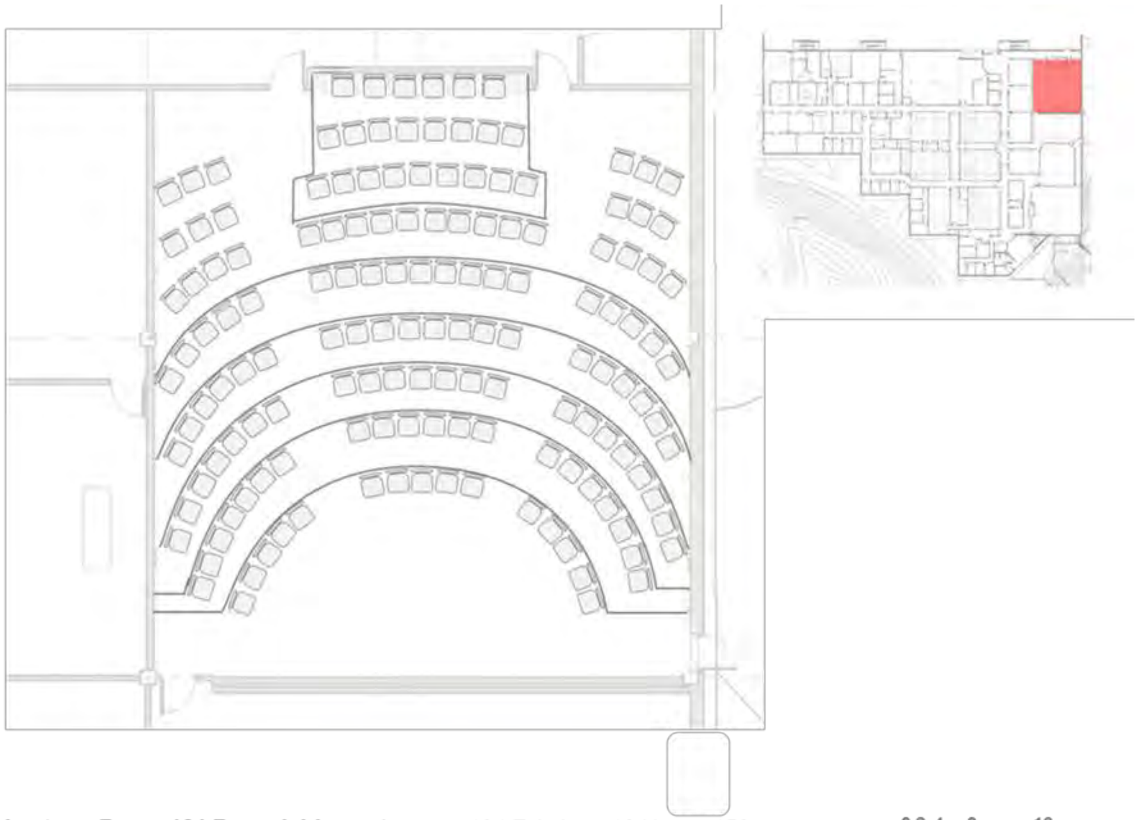
0 1 2 4 8



160 Seat Seminar Room Option 2
University of North Carolina at Charlotte
Burson Building



160 Seat Seminar Room Option 2a
University of North Carolina at Charlotte
Burson Building



Lecture Room 121 Remodel Layout
University of North Carolina at Charlotte
Burson Building

134 Existing+ 16 New = 150

0 2 4 8 16

Section 7
Facility Options

7.0 FACILITY OPTIONS

Two primary options have been described in this study including:

Option 1: Renovations to Burson Building Existing

Option 2: Expansion and Renovation to Burson Building

Burson Building from Craver Road

Option 1: Renovations to Burson Building

Option 1 will include various renovations to the Burson Building primarily related to the replacement of the existing air supply and exhaust system. These renovations will also include selected modifications to create additional teaching and research lab space. Generally the initial phase will include the temporary relocation of the second floor occupants to self-contained pre-engineered modular offices, classrooms, and laboratories. The existing rooftop air exhaust system serving the second floor will be removed and new supply and exhaust air equipment will be installed in its place. The existing air supply system located in the first floor mechanical room will remain operational serving the first floor occupants.

Following the completion of the second floor renovations and the installation of the air supply and exhaust equipment serving the second floor, the occupants will re-occupy the second floor and the first floor occupants will relocate to the modular offices, classrooms, and laboratories. Following the completion of the first floor renovations, the first floor will be re-occupied.

The renovations to the Burson Building will include the following:

a. Architecture
   1. Replace roof and reconfigure roof drains for new curb-mounted mechanical room penthouse.
   2. New rooftop screen at new mechanical penthouses
   3. New ceilings (ductwork replacement and new fire protection system)
   4. Selected partition relocation as required for functional renovations
   5. New fire-rated shaft for air supply to first floor mechanical room
   6. New bench fume hoods to replace existing bench fume hoods
   7. New glazed fume hoods to replace existing bench top exhaust canopies
   8. New bench tops in existing teaching labs with existing bench top exhaust canopies
   9. Selected restroom modifications to accommodate ADA access

10. New freight elevator with roof access
11. Selected exterior masonry façade, waterproofing, and exterior stair repairs

b. Structure
   1. Roof top curb structure to support new mechanical penthouse.
   2. Miscellaneous repairs as mentioned in Section 3.

c. Heating, Ventilation, Air Conditioning (HVAC)
   1. New prefabricated air handling units (AHU's)

d. Electrical
   1. New emergency generator
   2. Replace main power switchboard and panels
   3. Replace building lighting systems
   4. New security system and IT communications system.

e. Plumbing and Fire Protection
   1. New fire pump
   2. New building fire sprinkler system

Option 2- Expansion and Renovation to Burson Building

Option 2 will include the expansion of the Burson Building as well as the replacement of the existing air supply and exhaust system. These renovations will also include selected modifications to create additional teaching and research lab space in Burson Building. Generally the initial phase will include the construction of the addition, followed by the temporary relocation of the second floor occupants to the addition as well as to self-contained pre-engineered modular offices, classrooms, and laboratories as required. The existing rooftop air exhaust system serving the second floor will be removed and new supply and exhaust air equipment will be installed in its place. The existing air supply system located in the first floor mechanical room will remain operational serving the first floor occupants. The existing parking including accessible spaces will require relocation.

Following the completion of the second floor renovations and the installation of the air supply and exhaust equipment serving the second floor, the occupants will re-occupy the second floor and the first floor occupants will temporarily relocate to the addition and the modular offices, classrooms, and laboratories. Following the completion of the first floor renovations, the first floor will be re-occupied and the teaching labs in the addition will be used for their intended purpose.
The addition and renovations to the Burson Building will include the following:

a. Architecture
    1. New masonry and limestone façade for addition
    2. New aluminum windows and entries for addition
    3. New standing seam metal penthouse roof or metal screen
    4. Replace existing roof and relocate roof drains for new AHU's
    5. New ceilings (ductwork replacement and new fire protection system)
    6. Selected partition relocation as required for functional renovations
    7. New fire-rated shaft for air supply to first floor mechanical room
    8. New bench fume hoods to replace existing bench fume hoods
    9. New glazed fume hoods to replace existing bench top exhaust canopies
    10. New bench tops in existing teaching labs with existing bench top exhaust canopies
    11. Selected restroom modifications to accommodate ADA access
    12. New freight elevator with roof access
    13. Selected exterior masonry façade, waterproofing, and exterior stair repairs

b. Structure
    1. New concrete or structural steel addition structure
    2. New concrete slab on grade and concrete/metal deck elevated floors
    3. Burson Building roof top curb structure to support new AHU's
    4. Miscellaneous repairs as mentioned in Section 3.

c. Heating, Ventilation, Air Conditioning (HVAC)
    1. New curb-mounted packaged air handling units for addition
    2. New curb-mounted packaged air handling units for Burson Building

d. Electrical
    1. New emergency generator
    2. Replace main power switchboard and panels
    3. Replace building lighting systems

e. Plumbing and Fire Protection
    1. New fire pump
    2. New building fire sprinkler system

f. Sitework/Utilities
    1. Relocate parking spaces including accessible parking spaces
    2. New driveway for addition receiving area.
    3. Demolition of asphalt associated with Lot #15.
    4. New sod and landscaping

The following images represent a concept study of the Burson Building Addition.

Existing Burson Building from Craver Road

Proposed Addition to Burson (Option 2)

The following pages include the diagrams noted below:

Existing Burson Building

Existing First Floor by Space Type
Existing First Floor by Department Type
Existing Second Floor by Space Type
Existing Second Floor by Department Type

Option 1

Proposed First Floor Option 1 by Space Type
Proposed First Floor Option 1 by Department Type
Proposed Second Floor Option 1 by Space Type
Proposed Second Floor Option 1 by Department Type

Option 2

Proposed First Floor Option 2 by Space Type
Proposed First Floor Option 2 by Department Type
Proposed Second Floor Option 2 by Space Type
Proposed Second Floor Option 2 by Department Type

EXISTING FIRST FLOOR - BY SPACE TYPE

1" = 50'-0"

Stantec

Client/Project

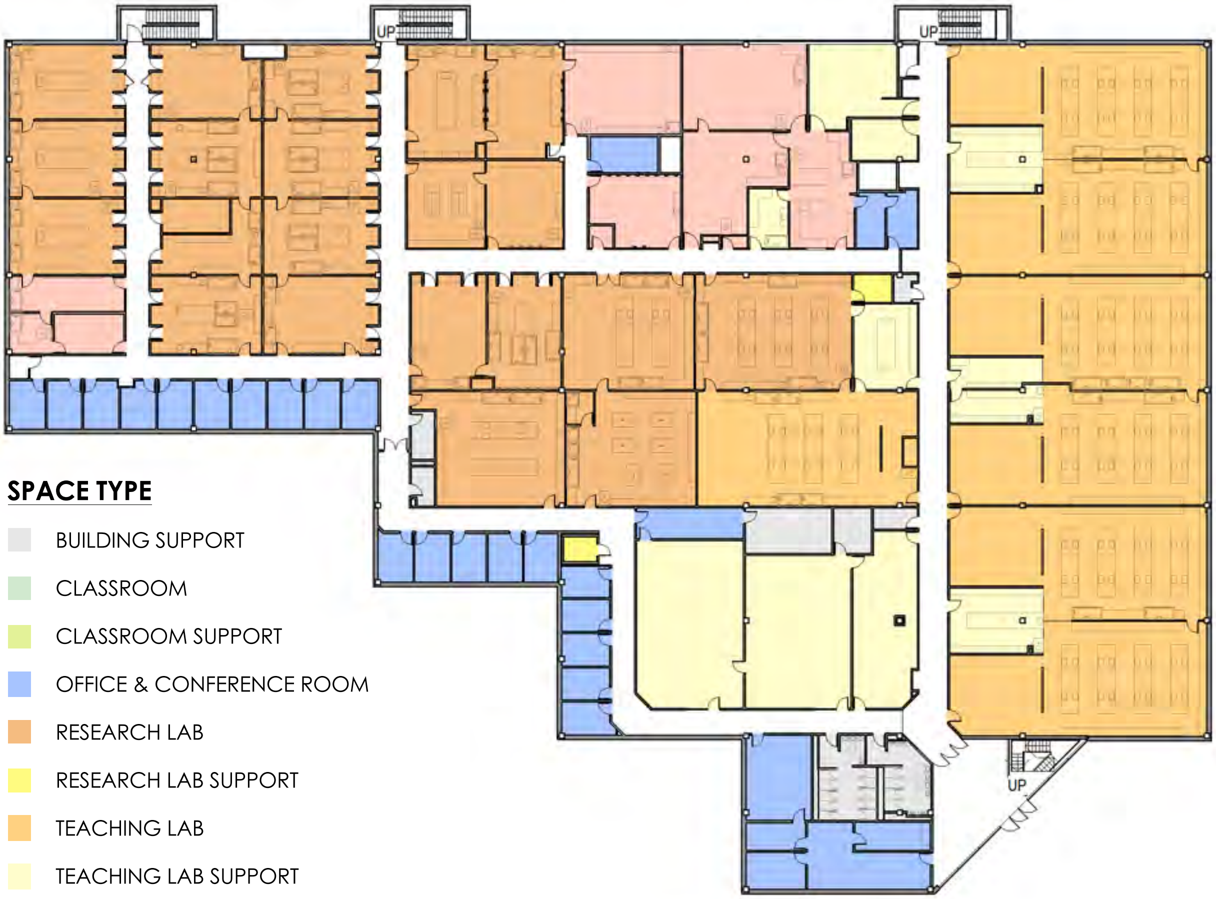
University of North Carolina - Charlotte Burson Building Feasibility Study

Title

Existing First Floor - By Space Type

EXISTING FIRST FLOOR - BY DEPARTMENT

1" = 50'-0"

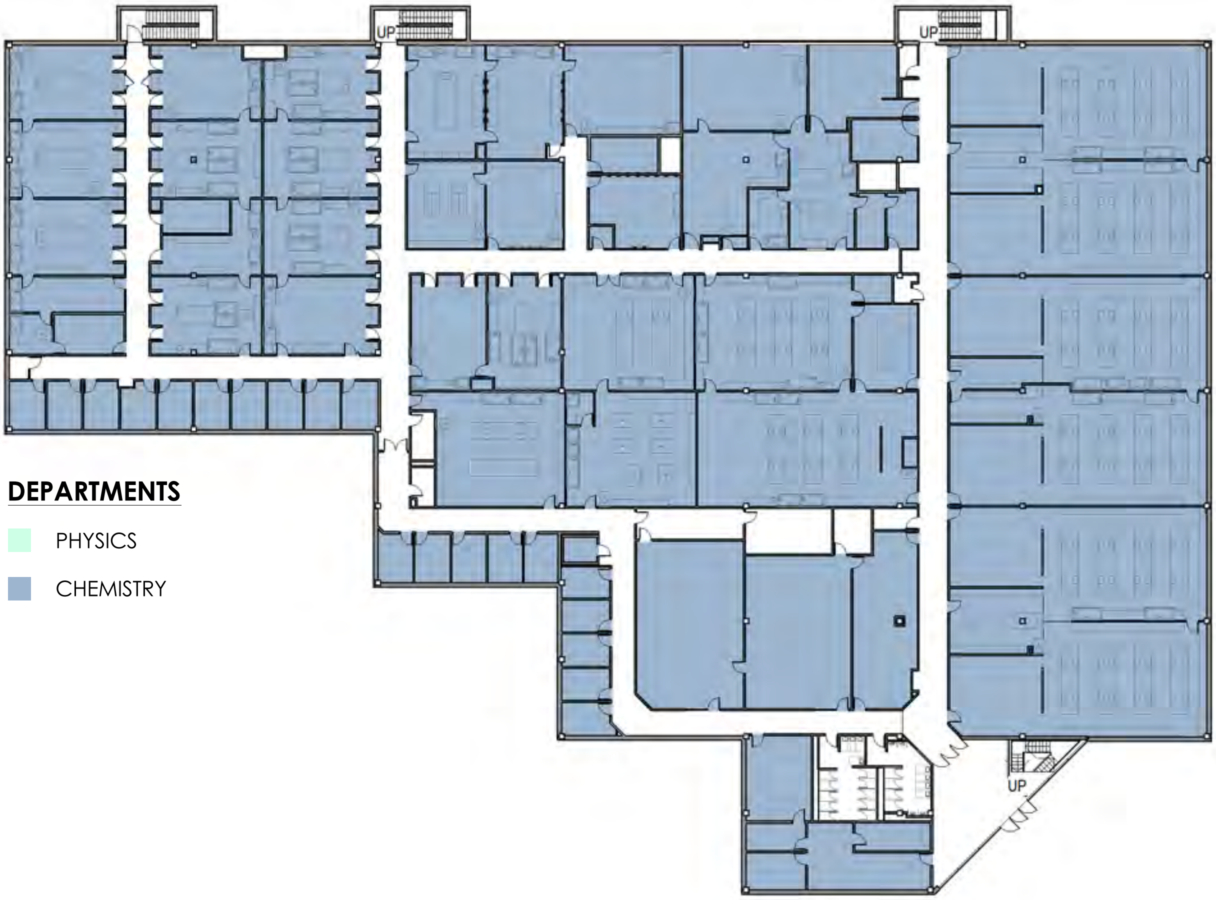


SPACE TYPE

- BUILDING SUPPORT
- CLASSROOM
- CLASSROOM SUPPORT
- OFFICE & CONFERENCE ROOM
- RESEARCH LAB
- RESEARCH LAB SUPPORT
- TEACHING LAB
- TEACHING LAB SUPPORT
- SHARED LAB SUPPORT

EXISTING SECOND FLOOR - BY SPACE TYPE

1" = 50'-0"



EXISTING SECOND FLOOR - BY DEPARTMENT

1" = 50'-0"

SPACE TYPE

- BUILDING SUPPORT
- CLASSROOM
- CLASSROOM SUPPORT
- OFFICE & CONFERENCE ROOM
- RESEARCH LAB
- RESEARCH LAB SUPPORT
- TEACHING LAB
- TEACHING LAB SUPPORT
- SHARED LAB SUPPORT

PROPOSED FIRST FLOOR OPTION 1 - BY SPACE TYPE

1" = 50'-0"

Stantec

Client/Project

University of North Carolina - Charlotte Burson Building Feasibility Study

Title

Proposed First Floor - Option 1 By Space Type

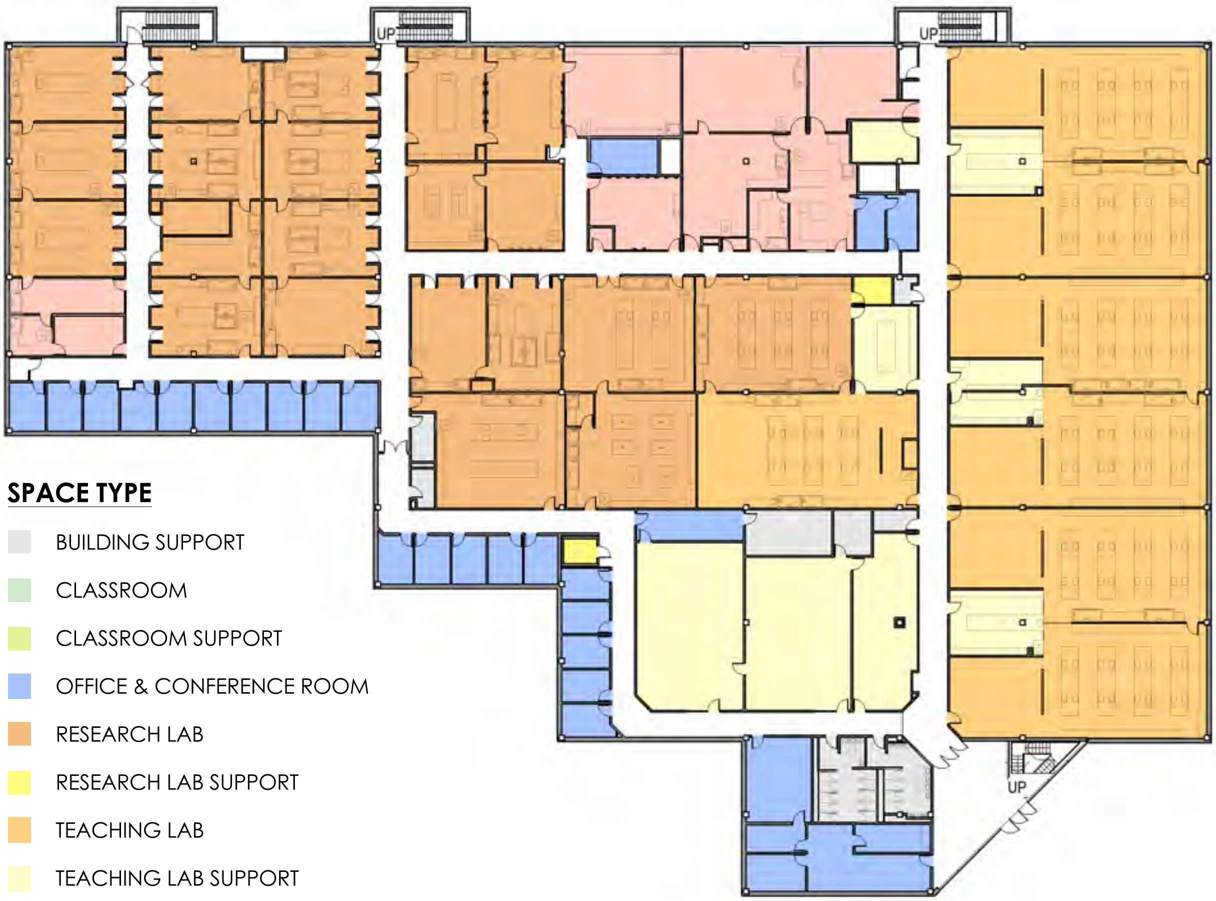
DEPARTMENTS

PHYSICS

CHEMISTRY

PROPOSED FIRST FLOOR OPTION 1 - BY DEPARTMENT

1" = 50'-0"



SPACE TYPE

- BUILDING SUPPORT
- CLASSROOM
- CLASSROOM SUPPORT
- OFFICE & CONFERENCE ROOM
- RESEARCH LAB
- RESEARCH LAB SUPPORT
- TEACHING LAB
- TEACHING LAB SUPPORT
- SHARED LAB SUPPORT

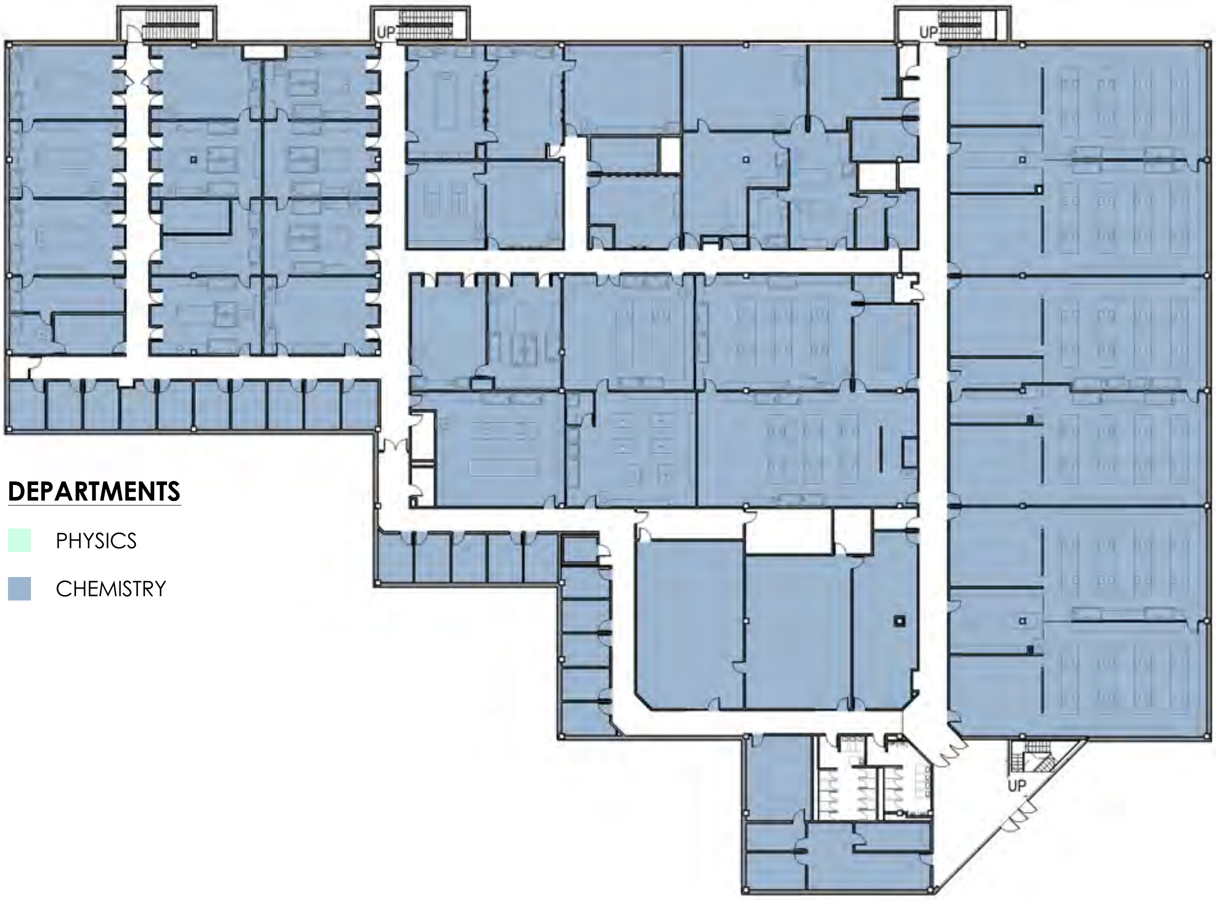
PROPOSED SECOND FLOOR OPTION 1 - BY SPACE TYPE

1" = 50'-0"

Stantec

Client/Project
University of North Carolina - Charlotte Burson Building Feasibility Study

Title
Proposed Second Floor - Option 1 By Space Type



PROPOSED SECOND FLOOR OPTION 1 - BY DEPARTMENT

1" = 50'-0"

PROPOSED FIRST FLOOR OPTION 2 - BY SPACE TYPE

1" = 50'-0"

Stantec

Client/Project
University of North Carolina - Charlotte Burson Building Feasibility Study

Title
Proposed First Floor - Option 2 By Space Type

PROPOSED FIRST FLOOR OPTION 2 - BY DEPARTMENT

1" = 50'-0"

PROPOSED SECOND FLOOR OPTION 2 - BY SPACE TYPE

1" = 50'-0"

Stantec

Client/Project

University of North Carolina - Charlotte Burson Building Feasibility Study

Title

Proposed Second Floor - Option 2 By Space Type

PROPOSED SECOND FLOOR OPTION 2 - BY DEPARTMENT

1" = 50'-0"

Stantec

Client/Project
University of North Carolina - Charlotte Burson Building Feasibility Study

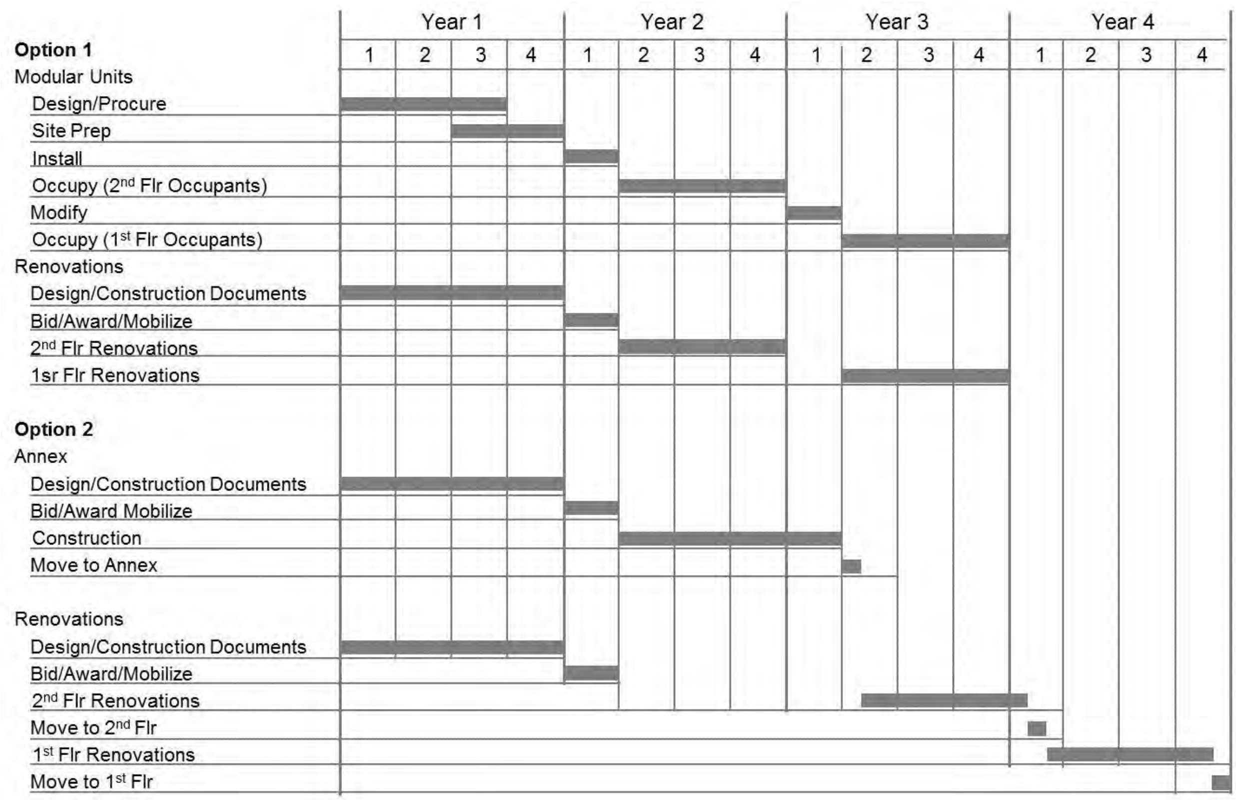
Title
Proposed Second Floor - Option 2 By Department

Section 8
Project Phasing

8.0 PROJECT PHASING

Schedule

A 3 year timeframe is estimated for option 1 and 4 years is estimated for option 2 as indicated in the overall project schedule below.



Phasing

Option 1: Renovate Burson

The existing building is to be renovated in two phases. Phase 1 includes the second floor and major mechanical systems. The first floor would then be renovated in Phase 2. Very little swing space is available on campus, thus, temporary modular units are required to clear out the second floor for construction (and later the first floor). Six modular units, consisting of nine trailers each, are estimated to be needed. The proposed location for the modular units is lot #19, just down Craver Road from Burson, per the diagram below.

Lot#19 with outline of six modular units.

Option 2: Renovate existing building and construct addition

Constructing the addition allows multiple phasing possibilities. One option is to construct the addition and use a combination of modular units and the addition as swing space. However, with a little creative planning the addition can accommodate all of the swing space. The project phasing shown below is based on utilizing <u>zero</u> modular units:

Phase 1.0 Relocate electrical transformers and cooling tower
Relocate site utilities
Construct temporary egress routes
Relocate receiving

Phase 1.1 Construct Annex
Delay outfitting of 1st floor classroom and furnish for temporary offices
Outfit all Teaching Labs for Chemistry

Phase 1.2 Relocate 2nd floor occupants
- Chemistry 2nd floor offices to Annex 1st floor
- Chemistry 2nd floor teaching labs to Annex 2nd floor teaching labs
- Chemistry 2nd floor research labs to Annex 1st floor teaching labs
- Chemistry SHR support to remain operational

Phase 1.3 Replace 2nd floor HVAC

Phase 1.4 Reoccupy Burson 2nd floor
- Reoccupy Chemistry offices
- Reoccupy Teaching Labs
- Reoccupy Research Labs
- Repurpose three Annex 1st floor Chemistry Teaching Labs for Physics

Phase 2.1 Relocate 1st floor occupants
- Physics 1st floor offices to Annex 1st floor
- Physics 1st floor Teaching Labs to Annex 1st floor
- SHR classrooms shut down for the Summer
- Repurpose Burson 1st floor Physics Teaching Labs for Chemistry Research Labs

Phase 2.2 Replace 1st floor HVAC

Final Reoccupy Burson 1st floor
- Reoccupy Chemistry offices
- Reoccupy Chemistry Research Labs
- Reoccupy Burson Classrooms

Complete Annex 1st floor classroom

The chart below indicates the distribution of space types by the various phases.

SUMMARY	Burson + Annex								
	Chemistry				Physics		Shared		
	Offices & Conf. Rms	Res. Lab + Support	Teach. Labs + Support	Shared Lab Support	Offices & Conf. Rms	Teach. Labs + Support	Classrms + Support	Bldg Support	
EXISTING	6,579	20,709	19,241	6,952	2,604	7,964	9,326	19,818	93,193
PH 1 - Build Annex	10,329	34,209	38,241	8,052	2,604	7,964	11,326	26,818	139,543
PH2 - Renovate 2nd Flr	7,609	20,833	20,475	6,952	1,043	7,964	11,326	19,245	95,447
PH 3 - Renovate 1st Flr	8,692	20,876	36,189	4,636	1,043	5,973	2,973	18,263	98,645
FINAL	9,817	29,975	43,589	8,052	1,043	5,973	14,276	26,818	139,543

Section 9
Facility Systems Descriptions

9.0 FACILITY SYSTEMS DESCRIPTIONS

CODE REVIEW

The following codes are to be followed by discipline:

Architectural
Latest editions of North Carolina Building Code, North Carolina Fire Code, North Carolina Energy Code, Americans with Disabilities Act

Electrical
Latest editions of North Carolina State Building code and North Carolina State Energy code, NFPA 70,101, & 110 along with the provisions and standards of the North Carolina Department of Administration State Construction and North Carolina Department of Insurance Office of State Fire Marshal.

Mechanical
NC Mechanical and Energy Codes, NFPA, ASHRAE standards and NC State Construction Office (SCO) guidelines will be adhered to when the project is designed.

There are several NFPA sections that will be reviewed/required for the NC SCO guidelines as well as ASHRAE 15, 62.1, 90.1 (as applicable when reviewing the applicable NC Energy Code), and 110 at a minimum.

Structural
2012 NC State Building Code

ARCHITECTURAL SYSTEMS

Architectural

Exterior systems

Option 1- Burson Renovations
The existing brick exterior and aluminum framed windows will remain. However, extensive HVAC work is expected on the roof and complete roof replacement is anticipated. The new roof is to be 60 mil, PVC with sloped insulation.

Option 2 – Burson Addition & Renovation
The building addition will have a brick and limestone façade consistent with other recent buildings constructed on campus, such as the nearby Student Union and the adjacent Health and Human Services building. A standing seam sloped metal roof or mansard is anticipated. A low-slope (1/4" / foot) roof is anticipated above the penthouse and will consist of 60 mil, PVC with sloped insulation.

Interior systems

Interior Partitions

Most of the existing interior walls are concrete masonry units (CMU) and will remain as-is. If modifications are required, the intent is to patch with matching CMU to the greatest extent possible. New partitions are to be metal studs with gypsum board are to extend from floor to deck above.

Finishes

The architectural finishes in the existing building will generally remain except all ceilings will be replaced due to the extent of the mechanical, electrical and plumbing system work required above the ceilings. The new ceilings will match the existing ceilings that are generally lay-in type ceilings. Where room renovations are to occur, the flooring will be mostly vinyl composition tile (VCT) consistent with the existing flooring. Finishes in the renovated toilet rooms will be ceramic tile, consistent with existing.

Finishes in the new addition will be similar to those in the existing building including:

1. Floors: Vinyl Composition Tile in labs, support labs and corridors. Ceramic tile in toilet rooms. Terrazzo flooring in the new lobby.
2. Base: 4" high rubber cove base at walls and casework in the labs, support labs and corridors. Ceramic tile in toilet rooms. Integral terrazzo base in the new lobby.
3. Walls: New walls to be gypsum board on metal studs with low luster paint.
4. Ceilings: 2' x 4' washable, lay-in acoustic tile on standard 15/16" grid in the labs and support spaces. 2' x 2' fissured acoustic lay-in panels in 9/16" grid in the corridors.
5. Doors: Wood doors with view windows and hollow metal frames. Single doors shall be 3'-0" wide and double doors shall have a 3'-0" wide active leaf and a 1'-6" minimum inactive leaf.

Laboratory Casework

The existing laboratory casework in Burson will remain. Laboratory casework in the new addition (option 2) will be fixed wood. Base cabinets will consist of mostly drawer units in the teaching labs and a 50/50 mix of drawer and door cabinets in the research labs. Wall cabinets and tall storage cabinets will also be wood with framed glass door panels.

Laboratory Countertops/Sinks

The existing laboratory countertops will remain with the exception of those located at the existing fume hoods and at the student stations (islands) in the teaching labs. New countertops will be 1" think epoxy resin. Sinks will be under-mount type, epoxy resin to match the countertops.

Laboratory Fume Hoods

The existing laboratory fume hoods are auxiliary air type hoods and no longer provide adequate ventilation. They are to be replaced with modern, standard chemical fume hoods with vertical rising sashes. Similarly, the existing fume exhaust devices at the student stations in the 2nd floor teaching labs do not provide adequate ventilation. Two options are being considered for their replacement: 1) Glass fume hoods, and 2) Snorkels and/or countertop exhausts. In either case, the existing work-surfaces at these student islands would be replaced. The existing base cabinets below are to remain.

Miscellaneous Items

1. Combination deluge shower / eyewash units are to be provided that meet ANSI Z358.1 requirements and ADA.
2. Fire extinguishers are to be located in each lab and shall be equal to 4A-60B:C, 10 pound capacity, multipurpose, dry chemical type.
3. White marker boards shall be 24-gauge porcelain enamel.
4. Bulletin boards shall be ¼" colored cork.
5. Projection screens: Permanent recessed mounted motorized projection screen with tab tensioning.
6. Projector mounts: Mounting bracket for a digital projector provided by the owner, provide computer wall interface.

Interior Signage

1. ADA compliant tactile room signs and building directory signs per UNC standards

HVAC SYSTEMS DESCRIPTION

Mechanical

The HVAC systems, including the fume hoods, are beyond their serviceable life expectancy with the exception of the recently installed chiller (2011) and standby boiler (2008) for summer operation.

The remaining systems require a complete controls and air balance calibration. This calibration, especially for the controls, should occur on a regular basis. While some of the controls have been upgraded to DDC electronic with a building management system (BMS), the remaining existing pneumatic controls are antiquated in comparison to what is available in direct digital controls (DDC) today. The BMS interface is highly recommended to be updated and utilized to alert facilities personnel of any problems that may occur so that they are promptly addressed. Without the BMS, it may be days or even weeks before a problem is recognized and corrected. The testing, adjusting and balancing portion of the work is recommended to be a direct hire of the University to ensure the best quality results. A select group of AABC or NEBB certified contractors could be recommended.

The building has insufficient exhaust at the student hoods from the original design, potentially insufficient and poorly controlled makeup air to the large fume hoods and no make-up air to the student hoods resulting in a negatively pressurized building, and the roof is leaking water, all which can lead to mold growth and poor indoor air quality. The ductwork likely leaks beyond today's industry standards resulting in poor exhaust performance at the room/hood level and in fans that may be operating in their motor's service factor rating.

There is a concern of fume hood exhaust and its effect on adjacent buildings' fresh air intakes.

The outside air intake for the primary air handling unit of the building is located near the loading dock which occupants have reportedly complained of vehicle exhaust fumes. As noted in the plumbing section, the natural gas pressure reducing valve also appears to vent gas heavily at times contributing to the smell and potential for poor indoor air quality.

There is presently no reported 'working' means of measuring outside air coming into the primary air handler to assure proper building balance and pressurization. Although an outside air flow measuring station is shown on the record drawings, it would appear it is no longer reliable.

The organic chemistry teaching labs should be equipped with 3 linear feet of fume hood for each student, with a current 80% deficiency rating. The remaining lab areas should be evaluated to determine their fume hood needs and modifications made accordingly.

It is recommended that the storage of chemicals be in vented enclosures to best contain the fumes; currently, the chemicals are on open shelves and fill some of the rooms. While this can be dealt with, it requires much more in the way of air changes and energy to provide proper ventilation.

Plumbing

As for the plumbing, the issues are mostly from a problem and deficiency standpoint.

The primary roof drainage system seems adequate with water standing only where the roof slope is inadequate for drainage. The secondary roof drainage (or emergency overflow drains) is handled by roof scuppers installed at the base of the roof perimeter parapet wall.

The toilet room fixtures are the original fixtures and are not of the water saving, high efficiency, type. Toilet rooms were laid-out before ADA requirements and need to be upgraded to current codes.

The currently installed hot water heater system is inoperative due to what is believed to be issues with a combined flue and combustion air vent.

There is poor water pressure in some of the lab spaces that requires further study, possibly pipe resizing and/or introduction of a booster pump.

There is no backflow prevention on domestic piping entering the building.

The acid waste, while provided with acid waste piping at the user level, combines with the general sanitary sewer without acid neutralization when it leaves the building. There is reportedly an acid waste disposal policy in place at UNCC that prevents acid waste from being dumped down the drain.

There are two natural gas services for the building; one serves the labs, and the other serves the water heaters and a small steam boiler. The natural gas pressure reducing valves are located in front of the outside air intakes that serve the main air handler of the building. The valves must be venting heavily at times as gas was smelled at the time of the site survey. The valve discharge should be vented up to above the roof level.

There is a de-ionized (DI) water system located in the first floor main mechanical room that serves only the research labs. The DI system is a non-circulating type and only delivers water from a local pump.

There is a lab compressed air system that provides compressed air to the laboratories.

Any need for specialty gases are provided at the point of use with portable DOT cylinders. The primary specialty gas used is nitrogen. Liquid nitrogen cryogenic tanks are also utilized for the Nuclear Magnetic Resonance Spectrometer (NMR).

Fire Protection

Building is currently not equipped with any automatic fire suppression systems. NFPA 45 “Standard on Fire Protection for Laboratories Using Chemicals” classifies this as a Class C laboratory and requires sprinkler protection and further recommends that hose standpipes be provided. If any renovations are to be made to this building, sprinklers will be required and the case for a fire pump will need to be reviewed.

Building is currently equipped throughout with portable ABC fire extinguishers. Several type D fire extinguishers were seen located in the corridors.

Electrical

The electrical system for this building is loop feed from the campus grid at 12,470 volts with pad mounted S&C switches and distribution transformers to reduce the voltage to service entrance levels of 277/480, 120/208 volts. There are three (3) primary Westinghouse switch boards mfg. in 1984, one (1) at the 277/480 voltage level, rated at 1600 amps "SBA", and two (2) at the 102/208 voltage level, rated at 2500 amps "SBB" and "SBC". This service entrance gear appears to be in fair condition. The distribution is completed by feeds out from this gear to sub-panels located with-in the building.

Generated emergency power is supplied by a small diesel generator for life safety functions only.

Lighting with-in the building appears to be predominantly T12 type fixtures with lower than required light levels in many areas. As areas have been renovated in the past, lighting has been modified and improved with more energy efficient and better light levels using newer T5 and T5HO fixtures.

Fire alarm system with-in the building has been upgraded in the recent past to a modern addressable zone type system. This system consists of Simplex 4020 controller with voice command.

End of Section

Section 10
Construction Cost Estimate

10.0 CONSTRUCTION COST ESTIMATE

The following summary of the construction cost estimate includes the range of possible construction costs for Options 1 and 2. Detailed estimates are included in Appendix B.

Option 1 – Renovation (6 modular units)

	Low End	High End
1. Sitework	$0	$0
2. Architectural	$3,000,000	$3,500,000
3. Miscellaneous Building/Structural Repairs	$200,000	$300,000
4. Elevator	$250,000	$350,000
5. Fittings & Equip (Casework & FH's)	$3,500,000	$4,000,000
6. MEP	$11,500,000	$13,000,000
7. Temp Facilities (modular units)	$6,000,000	$8,000,000
8. General Conditions	$12,000,000	$14,000,000
9. Construction Cost	**$36,450,000**	**$43,150,000**
10. Project costs (approx. 30 % of line 9)	$10,935,000	12,945,000
11. Parking lot cost for modular units	$1,310,000	$1,310,000
12. Parking at Burson Building (61 spaces)	$305,000	$305,000
Total preliminary project cost (total of lines 1-12)	**$49,000,000**	**$57,710,000**

Option 2 - Renovation and 2 Story Addition (3-4 modular units)

	Low End	High End
1. Sitework	$700,000	$800,000
2. Architectural	$13,000,000	$14,000,000
3. Miscellaneous building/Structure Repairs	$200,000	$300,000
4. Elevator	$250,000	$350,000
5. Fittings & Equip (Casework & FH's)	$7,000,000	$8,000,000
6. MEP	$14,000,000	$17,000,000
7. Temp Facilities (modular units)	$4,500,000	$6,000,000
8. General Conditions	$20,000,000	$22,000,000
9. Construction Cost (Total of lines 1-8)	**$59,650,000**	**$68,450,000**
10. Project costs (approx. 30 %)	$17,895,000	$20,535,000
11. Parking lot cost for modular	$655,000	$655,000
12. Parking at Burson Building (61 spaces)	$305,000	$305,000
Total preliminary project cost (Total of lines 1-12)	**$78,505,000**	**$89,945,000**

Option 2.1 - Renovation & Addition
(No modular units)

	Low End	High End
1. Sitework	$700,000	$800,000
2. Architectural	$13,000,000	$14,000,000
3. Miscellaneous Bldg/Structural Repairs	$200,000	$300,000
4. Elevator	$250,000	$350,000
5. Fittings & Equip (Casework & FH's)	$7,000,000	$8,000,000
6. MEP	$14,000,000	$17,000,000
7. Temp Facilities (modular units)	$0	$0
8. Temp Renovations	$1,000,000	$1,500,000
9. General Conditions	$18,000,000	$20,000,000
10. Construction Cost (Total lines 1-9)	**$54,150,000**	**$61,950,000**
11. Project costs (approx. 30 % of line 10)	$16,245,000	18,585,000
12. Parking lot cost for modular units	$0	$0
13. Parking at Burson Building (61 spaces)	$305,000	$305,000
Total preliminary project cost (Total Lines 1-13)	**$70,700,000**	**$80,840,000**

General conditions include general contractor overhead and profit, bonds, escalation, contingencies
Project costs include moving costs, design fee's, survey's, interest during construction etc.

Cost Options

1. Option One
   Snorkel exhausts in lieu of glass fume hoods at student stations in General Chemistry & Quant Labs (2 students per snorkel). 56 count. - $730,000
2. Option Two
   Snorkel exhausts in lieu of glass fume hoods at student stations in General Chemistry & Quant Labs (2 students per snorkel). 104 count. - $1,350,000

End of Section

Section 11
Facility Utility Demand Estimate

11.0 FACILITY UTILITY DEMAND ESTIMATE

The following summary provides a preliminary estimate of the utility demands for the two options.

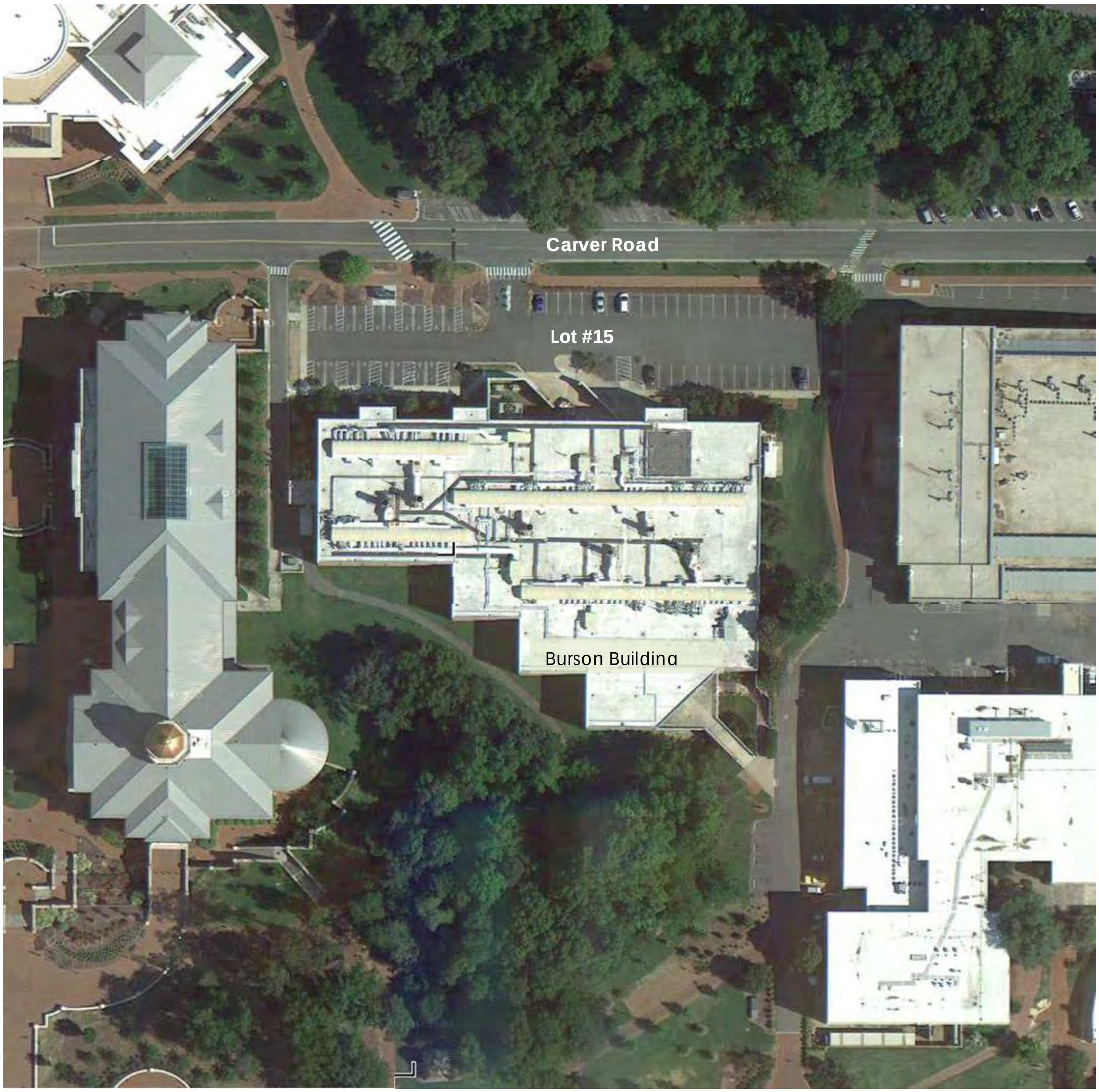
	Option 1	**Power**	**Option 2**	**Power**
Chiller 1 (500/650 tons)	500 kW w/ VFD	602 amps	650 kW w/ VFD	782 amps
Chiller 2 (500/650 tons) (Redundant)	500 kW w/ VFD	(602 amps)	650 kW w/ VFD	(782 amps)
PCH-1 Primary Chilled Water Pump	10 HP	14 amps	15 HP	21 amps
PCH-2 Primary Chilled Water Pump	10 HP	14 amps	15 HP	21 amps
SCH-1 Secondary Chilled Water Pump	15 HP w/ VFD	21 amps	20 HP w/ VFD	27 amps
SCH-2 Secondary Chilled Water Pump	15 HP w/VFD	21 amps	20 HP w/ VFD	27 amps
SCH-3 Secondary Chilled Water Pump (Redundant)	15 HP w/VFD	(21 amps)	20 HP w/ VFD	(27 amps)
CT-1 Cooling Tower (500/650 tons)	(2) 20 HP with VFDs	54 amps	(2) 25 HP w/ VFDs	68 amps
CT-2 Cooling Tower (500/650 tons) (Redundant)	(2) 20 HP with VFDs	(54 amps)	(2) 25 HP w/ VFDs	(68 amps)
CWP-1 Condenser Water Pump	10 HP	14 amps	15 HP	21 amps
CWP-2 Condenser Water Pump	10 HP	14 amps	15 HP	21 amps
Air Compressor (Dual Compressor)	7.5 HP	11 amps	10 HP	14 amps
HWP-1 Heating Hot Water Pump	7.5 HP w/VFD	11 amps	10 HP w/ VFD	14 amps
HWP-2 Heating Hot Water Pump (Redundant)	7.5 HP w/VFD	(11 amps)	10 HP w/ VFD	(14 amps)
AHU Supply Air Fans				
Option 1 - (4) 50,000 cfm @ 10", (1) being redundant	(4) @ 125 HP each w/VFDs	468 amps		
Option 2 - (5) 50,000 cfm @ 10", (1) being redundant		(156 amps)	(5) @ 125 HP ea. w/ VFDs	624 amps

	Option 1	Power	Option 2	Power
AHU Return Air Fans - (may be less once detailed)				(156 amps)
Option 1 - (3) 50,000 cfm @ 4", (1) being redundant	(3) @ 50 HP each w/ VFDs	130 amps		
Option 2 - (4) 50,000 cfm @ 4", (1) being redundant		(65 amps)	(4) @ 50 HP ea. w/VFDs	195 amps
				(65 amps)
Fume Hood Exhaust Fans				
Option 1 - (5 total with 1 redundant)	(5) @ 50 HP each	325 amps		
125,000 cfm anticipated total exhaust at peak		(65 amps)		
Option 2 - (6 total with 1 redundant)			(6) @ 50 HP each	325 amps
150,000 cfm anticipated total exhaust at peak				(65 amps)
(Addition may have no fume exhaust, but may be considered for future)				
Domestic Water Heater #1 - Gas Fired	750,000 BTUH input		1,000,000 BTUH input	
Domestic Water Heater #2 - Gas Fired (Redundant)	750,000 BTUH input		1,000,000 BTUH input	
Steam Boiler #1 - Gas Fired (Replaces Central Plant steam) - 15 psi	3,500,000 BTUH input		4,500,000 BTUH input	
Steam Boiler #2 - Gas Fired (Replaces Central Plant steam) - 15 psi (Redundant)	3,500,000 BTUH input		4,500,000 BTUH input	
	Load with no redundancy	1582 amps		2160 amps
	Redundant Load	(974 amps)		(1152 amps)
	Total	**2556 amps**		**3312 amps**

End of Section

UNIVERSITY OF NORTH CAROLINA at CHARLOTTE

Burson Building Feasibility Study – Appendix



Stantec

Appendix A
Meeting Minutes

UNC-Charlotte Burson Building Feasibility Study- Programming Session #1

Date/Time: June 21, 2013 / 9:30 AM
Place: UNC-Charlotte Burson Building, Room 239B

Attendees: Dr. Bernadette Donovan-Merkert (bdonovan@uncc.edu), Jon Merkert (jmerkert@uncc.edu), Doug Walters (dwalters@uncc.edu), Michael Reagan (michael.reagan@uncc.edu), Rob Stout (rob.stout@stantec.com), Jim Eyth (jim.eyth@stantec.com), Dewey Williams (williams@uncc.edu), John Fessler (jafessle@uncc.edu), Jeanine Bachtel (jbachtel@uncc.edu) , Bridget Painter

Following are the main items discussed during the meeting:

General Discussion

- For the next programming session, Dr. Merkert will not be available the week of July 8th.
- Dr. Raja will need to be contacted regarding the Physics Department's interest in participating in the next programming session.
- Aside from Room 239A, there are no interactive spaces in the Burson Building. Additional interactive spaces are desired.
- Duke Centennial Hall is an example of the architectural style desired. Jeanine will send examples of a recent high-rise renovation which is a hybrid between old and new, with desired brick appearance.
- The current loading dock is not used with any frequency. Large trucks can't negotiate the small parking lot, and the doors are too narrow for large deliveries. Deliveries are made at the front of the building on the top level, which fronts the adjacent side street. The existing loading dock serves little purpose.
- Better connection between the upper and lower floors is needed. Currently, there is one interior stairway and one elevator connecting the two floors. Another stairway would assist in better flow.
- A small group space will be needed in the addition.
- There may be some reconfiguration of the existing front offices, which will be determined during the second programming session.
- Several utilities are routed to the Burson Building from the adjacent Cameron Building.

Chemistry Research Facilities

- Space is limited.
- There are currently 14 research faculty, with the potential to grow to 20 faculty by 2015 and 30 faculty by 2025. Therefore, additional faculty offices are needed. Also needed are additional common instrument areas.
- The biochemistry group should be kept together, along with the group's core equipment.
- The group was not in favor of open labs. There is a possibility for interdisciplinary labs that everyone shares, which could also be used by new faculty members temporarily until their new tailored lab is ready. New faculty members currently receive approximately 1,000 square feet of space.

- A walk-in hood should be located in a shared space. These are used infrequently, but are valuable when needed.
- Research Group size: average of ten students per space, minimum of eight students per space.
- There are few post-doctorate students. The post-doctorate, graduate and undergraduate students are all treated equally with respect to space.
- Currently, students use labs as a bench and perform all work there. Desk areas outside the labs are preferred. A fixed bench at the desk areas with mobile cabinets below for flexibility may be desired.
- There are currently two people per hood (eight feet in length). In some cases, there may be one person per hood.
- There is an eight foot long floor-mounted hood in several of the existing labs.
- Any future space will need to be shell space.
- Synthetic research comprises 80% of the program and there are ten people per lab. Also included per lab: ten – six foot long hoods, ten – four foot long bench spaces, and two sinks.
- Analytical research comprises 20% of the program. One or two- six foot long hoods per lab are needed.
- A chemical filtration system is located in the stock room.
- Nitrogen tanks are currently located in the classrooms (department to confirm). It is preferable to keep these out of the classrooms.
- Will consider using boil-off from liquid nitrogen tanks located in closets or near the labs.
- It is unknown if a cold room is needed, but one will be included in the study.
- There is no central glass-washing. The students clean glass in the labs.
- Natural gas is used in the research and teaching labs.
- Many of the synthesis researchers will need a separate room for instrumentation.
- Steam is used for heating in the organic teaching lab.
- Compressed air for NMR’s is needed. Compressed air is not needed in the research labs.
- All labs have deionized water, but currently there is no looped system.
- Chilled water is used in the laser and x-ray rooms, both of which need individual chillers. Central chilled water is not needed.
- Rotovaps need vacuum pumps.

Chemistry Teaching Facilities

- More space is needed. There are more labs taught in the Fall than the Spring. Space is close to capacity for 2013, but a lack of space for general chemistry labs is projected for the Fall of 2015.
- Currently, labs are taught from 8am until 11pm. Friday is utilized to restock the labs, but due to demand, one session is taught on Friday mornings. Currently, 1,500 students are taught through three labs. Room 202 is currently underutilized.
- In one scenario, existing teaching labs could become research labs.

- Bio-Chemistry teaching labs have a maximum capacity of 16 students (there are 12 students per lab now). Physical Chemistry (P Chem) teaching labs will likely not need to expand now. P Chem can remain where it is located, and move to a new building in the future.
- The general, organic and quant labs will move to the potential Burson annex.
- There are to be 25 occupants per teaching lab, including 24 students and one instructor.
- For the organic chemistry teaching lab, there should be a six- foot long hood for every two students (a seven-foot long hood is preferable). Also, one dispensing hood and one waste hood will be needed.
- For general chemistry, there are three hoods per teaching lab maximum. The group favors the current classroom/lab combination. Some features of the improved labs could include:
    - Use of a snorkel-type exhaust.
    - Countertop exhaust.
    - Dispensing hood and waste hood.
    - Vacuum and pumps at each island.
    - Multi-venue labs.
    - Direct access from each teaching lab to stockroom.
    - Windows looking into the labs.
    - If space along walls is limited, could use clear hoods in the center of the room.

Lecture Hall

- Two additional lecture halls are needed (one 200-person hall and one 90 to 100-person hall). Tiered seating is not necessarily needed if other solutions exist.
- Acoustics in the existing lecture halls are not effective. This issue should be addressed with the improvements.
- Tablet arm chairs may be used. The department will confirm.
- A preferred feature would include break-out spaces on each floor with white boards or glass with a writing surface.

Next Steps

- Schedule the second programming session. The group targeted July 15 and 16 as potential dates. Necessary stakeholder groups include:
    - Administrative staff
    - Physics faculty
    - Chemistry Teaching faculty
    - Chemistry Research faculty
    - Stockroom staff

The meeting adjourned at 12:15 PM.

The foregoing is considered to be a true and accurate record of all items discussed. If any discrepancies or inconsistencies are noted, please contact the writer immediately.

STANTEC CONSULTING SERVICES INC.

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c. Dr. Bernadette Donovan-Merkert, UNC-Charlotte
Dr. Jay Raja, UNC-Charlotte
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Jim Eyth, Stantec
Tom Phelps, Stantec
Bridget Painter, Stantec
Rick Gross, Stantec
Eddie Porcher, Stantec
Bert Evans, Stantec
Keith Bradley, Stantec

UNC-Charlotte Burson Building Feasibility Study- Programming Session #2

Chemistry Department Meeting

Date/Time: July 16, 2013 / 9:00 AM- 12:00 PM
Place: UNC-Charlotte Burson Building, Room 239B

Attendees: Dr. Bernadette Donovan-Merkert (bdonovan@uncc.edu), Jon Merkert (jmerkert@uncc.edu), Michael Reagan (michael.reagan@stantec.com), Rob Stout (rob.stout@stantec.com), Dewey Williams (williams@uncc.edu), Bridget Painter (bridget.painter@stantec.com), Jay Raja (jraja@uncc.edu), Craig Fox (crfox@uncc.edu), Casi Shepardson (clshepar@uncc.edu), Laurie Manderino (lmanderino@uncc.edu)

<u>Following are the main items discussed during the meeting:</u>

- Stantec summarized the three options:
    1. Renovating (mechanical issues).
    2. Renovating (mechanical issues) and adding more chemistry labs.
    3. Renovating, adding more chemistry labs and building annex.
    - Senior Associate Provost indicated that renovating and creating more chemistry labs is an important goal.

- Office Space Discussion:
    - Chair stated that the office needs more open space. The type of traffic on the office includes advising of students.
    - Senior Associate Provost indicated there are space requirements for the department chair's office and suggested having an administrative suite which combines administrative staff together instead of being spread out. This area will be separate from the faculty.
    - Stantec asked if this separation has worked for other offices. Senior Associate Provost mentioned that it will work best for this department. Chair indicated that the 3rd floor of Woodward includes an acceptable set-up.

- Research Space Discussion:
    - Chair stated there is space downstairs that can accommodate two new faculty. However, those spaces do not have hoods. There is space on the 2nd floor for one more faculty member.
    - Chair mentioned that additional issues include: (1) emergency power is needed, (2) water drips in labs due to condensation, and (3) separate space is needed for students to eat. Chair also indicated that an equal number of seats are needed in the classroom and lab.
    - Chemistry Department indicated that the classrooms sometimes are used for meetings. The students in the lab usually have items on the desks in the other room. It would be preferable to access the lab without the need to walk through the classroom section, to avoid disturbing a class in session.
    - Stantec showed diagrams of lab options available. The options include a glass wall and door separating the two spaces. The wall permits recycling air and outside air which includes a cascading air system.

- Chemistry Department asked about ductless hoods, noting that one was installed in a lab a month ago. Stantec indicated ductless hoods can be used but the Environmental, Health and Safety office is not sure of them to date. Some universities are using the ductless hoods.
- Different filters are needed for different chemicals. The filters need to be replaced on a regular basis. The Chemistry Department noted that the filter has not been replaced to date and that it hasn't been determined who will replace the filter. The Senior Associate Provost indicated that it needs to be determined whose responsibility it will be to replace the filters.
- Chemistry Department asked whose responsibility it is to pay for the filters. Senior Associate Provost indicated that if these filters save money, a plan will be determined regarding who will pay for and replace the filters.
- Chemistry Department indicated that the hood fans are loud. University Project Manager suggested talking to other schools that use the hoods. Chemistry Department stated that the sales representative had names of other schools that have used the product.
- Senior Associate Provost asked if a core lab facility can be designed. Chair indicated in some types of research there are very specific needs. A more synthetic lab will need more hoods. However, all labs should have hoods. Senior Associate Provost asked if two or three types can be designed. Chair indicated her preference would be to set up labs with more hoods, and keeping some labs flexible. Designer indicated that the lower end of space is 140 square feet per person. The typical hood design takes into account flammable and hazardous materials. Chemistry Department indicated there must be a waste area in the flame cabinet. Chair indicated that no current labs have a separation between the lab and student area. Chemistry Department likes the idea of the separate rooms. Stantec stated that the additional positive of having the lab and classroom separate is the student can have coffee or lunch at the desk. Senior Associate Provost noted that the auditors can reduce funding if they find the space being used in research labs being used for non-research tasks. Having separate areas will keep it in the guidelines.
- Stantec explained that one option is to have two separate student spaces consisting of 10 students in each space, which will reduce overall noise versus combining all students in one room. The Chair also likes two separate student spaces instead of one.
- Senior Associate Provost suggested if an annex is built it should consist of freshmen (introductory) chemistry and physics; the annex should not include research labs.
- Senior Associate Provost confirmed that introductory chemistry and physics will be located in the annex.
- Chair asked why all the plans are two-story when the previous decision included three-story. Stantec explained that if it is decided to go with three stories, a floor can be duplicated. Currently there are two floors of usable space, with the third floor being the penthouse for mechanical equipment.

- Renovation of Existing Building.
  - Senior Associate Provost asked:
    1. Can two additional teaching labs be created? Can we provide new research labs based on current space?
    2. How do we clean up and make faculty labs nicer?
    3. What kind of tweak can we do to existing research labs to improve them?
  - Chair asked if a decision were made today to build an annex, how long will it take to complete? Senior Associate Provost answered two or three years.

- Senior Associate Provost asked if there is any space to make into labs. Chair responded that there is not.
- Senior Associate Provost mentioned potential availability of space in Cameron. Chair responded that she wouldn't want only one faculty member to move, but a cluster move to Cameron is a possibility. Senior Associate Provost suggested Chair contact Dan Grove for a tour of Cameron to determine space availability.

- Mechanical
  - Stantec stated mechanical rooms will be penthouse-related. If it is decided to not build an annex, part of Burson may need to be shut down while renovations take place.
  - Discussion points:
    - There is a need for standby emergency power.
    - Chemistry guidelines indicate the number of students supervised by a faculty member or by a teaching assistant should not exceed 25. Enrollments in the 1000 and 2000 level labs exceed this guideline.
    - There is no adequate space to place new faculty.
    - The machine shop moved out of downstairs Burson, so that space can be used.
    - Since the electronic shop has a hood, it could possibly move. This location is very far from the stockroom, which is undesirable.

- Additional suggestions and comments:
  - Chemistry Department mentioned that the biochemistry lab (Room 173) is being renovated. Chair mentioned that the bio chemistry and quantitative labs could be combined.
  - Chemistry Department mentioned that organic chemistry could be taught in Room 202, which is the only room that has steam and is the only lab that can be used for organic chemistry.
  - Chemistry Department said that the only other empty spaces are Rooms 167 and 158 which are 945 and 315 sq. ft., respectively.
  - Chemistry Department will update Archibus with names and spaces.
  - 192 students are taught in each room every day. Their needs include: (1) own drawer (currently, there are two or three students per drawer), and (2) separate space for books and coats.
  - Stantec will investigate whether any local schools are using Option 1.8, which includes snorkel hoods over tables. This is only used for introductory classes since no hazardous materials are used. A benefit for this option is that there will be space for more labs. A negative is that participants need safety glasses and gloves at all times. Department mentioned that it will be difficult to enforce safety glasses and gloves.
  - Designer asked about how scheduling can work if there is no annex during renovation: Chemistry Department gave the following information:
    1. Classes run Monday – Thursday until 10:30 pm.
    2. Fridays are used for Graduate TAs and prepping labs.
    3. Saturday classes are not an option.
  - Facilities Planning Assignment: will review Archibus and talk to space planner regarding university space standards.
  - Senior Associate Provost said it's best to present to Chancellor later in September, after classes begin.

The foregoing is considered to be a true and accurate record of all items discussed. If any discrepancies or inconsistencies are noted, please contact the writer immediately.

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UNC-Charlotte Burson Building Feasibility Study- Programming Session #2
Physics and Chemistry Teaching/Labs Meeting

Date/Time: July 16, 2013 / 1:00PM- 5:00 PM
Place: UNC-Charlotte Burson Building, Room 239B

Attendees: Dr. Bernadette Donovan-Merkert (bdonovan@uncc.edu), Jon Merkert (jmerkert@uncc.edu), Michael Reagan (michael.reagan@stantec.com), Rob Stout (rob.stout@stantec.com), Dewey Williams (williams@uncc.edu), Bridget Painter (bridget.painter@stantec.com), Laurie Manderino (lmanderino@uncc.edu), Richard Jew (rjew1@uncc.edu), Kathy Asala (kasala@uncc.edu), Christopher Gilbert (cgilbert@uncc.edu), Jacob Horger (jhorger@uncc.edu), Susan Michael (smichael@uncc.edu), Scott Williams (scotwill@uncc.edu)

Following are the main items discussed during the meeting:

- Stantec explained that discussion has taken place regarding taking some space from Physics, if possible.
- Stantec showed 100 and 200 person lecture hall options on a slide show. Could renovate downstairs lecture halls or construct new lecture halls.
- Option 1.1 is the 100 person hall which will consist of two rows of seats per tier. The disadvantage of this option is sight lines are marginally compromised, will require two image projection spaces, and will require the use of a mouse to point instead of a laser since a laser will not display well.
- Facilities Planning indicated that fewer tiers and loose and/or fixed chairs are options. Recommended letting the building condition drive the heights of tiers.
- Designer indicated there is flexibility on the number of risers per tier. There can be two or three risers which would only be a three foot elevation difference between the front and back of the room. The disadvantage of three rows per tier is sight lines. The two foot elevation difference can be added in the front of the room which will make a four foot elevation difference in the back.
- Stantec indicated there is flexibility to re-tier an existing room, however there may be an issue with handicap access.
- Stantec asked if the two projected images mentioned earlier is an issue. Chemistry Department agreed with the two projected images but does not want the images to cover the board.
- Chemistry Department asked if curved tables are an option, Stantec indicated that they are.
- Stantec asked if power at every table is needed. Chemistry Department indicated there are not a large number of people using laptops; most have iPads or note pads. The use of IPads depends on Wi-Fi. Chemistry Department decided that power outlets will be good to have for future needs. Stantec will plan for power outlets.
- Stantec showed slide Option 1.4 which equals 99 seats and is 1600 square feet, rather than 2000 square feet, and includes a flat floor with round tables. Chemistry Department did not favor this option, and will only agree to Option 1.4 if it is a secondary room. Stantec indicated that most universities do not use Option 1.4. Chemistry Department stated that Option 1.4 would work only with three total lecture rooms. The Chair indicated that Option 1.4 could be used with the Annex option.
- Chemistry Department asked if there was any modularity with podium space. A larger front area is more suitable for chemical presentations. Having a modular podium gives more space options. Stantec indicated most universities use standardized podiums that can move to a certain diameter.

- Chemistry Department indicated some needs for lecture rooms: (1) space for demonstration capabilities in both the 100 and 200 seat lecture rooms (2) water (3) ventilation (4) gas, ability to roll a tank in (5) electric and (6) overhead camera so that the image can be projected on a screen.
- Stantec indicated that with a projected image a hood can be fixed and have all the ventilation and services it needs.
- For the 200 capacity lecture room, Facilities Planning indicated the need for 4 screens in front. Chemistry Department would like the room to be longer so the faculty can access more students from the edges.
- Facilities Planning asked the Chemistry Department if there is a need for a sound system. Chemistry Department indicated that if the room has good acoustics, a sound system isn't needed. However, pillars make it harder to hear. Chair believes having the option of a sound system is good. Stantec will include a sound system in pricing.
- Chemistry Department stated they would prefer a table arrangement instead of individual tablet arm spaces.
- Chemistry Department indicated that more small classrooms are needed. Right now there are three chemistry classrooms: Rooms 239B, 119, and 118. They would like to see more classrooms for group work. Room 119 has a seating capacity of 24.
- Chair asked Chemistry Department if they need more classrooms with 24 or 44 seating capacity. Chemistry Department prefers something in the middle. The best seating capacity would be 32 – 36 students. One room should be fixed (44) stadium seating (Room 118); however, ideally both would be. Make Room 119 a 36-seating capacity, also. The need is four-36 seating capacity rooms with modular tables.
- Chair stated that only 1000-level courses and lab will be in the annex. Depending on what happens to Physics, 1000-level Physics might be located there, also.
- The Chair indicated that the Senior Associate Provost does not want any research in the annex and stated that the Organic labs would stay in the main building.
- Stantec asked how any students will the quant lab need to accommodate. Chemistry Department replied 24 students. Hoods are needed and these may be candidates for snorkels. Also, needed is an area where students can sit and congregate. Stantec stated that spaces can be carved out in the corridor.
- Chemistry Department would like some natural light, which Stantec stated is possible on the second floor and the ends of the annex.
- For the annex, one option includes the following: (1) a narrower corridor, which is the same as the first option but there will be a ceremonial staircase, (2) entry and loading dock will be taken away (3) four teaching labs, three labs on top and an additional lab on the bottom.
- Chair mentioned that the stockroom is needed in the annex (a separate 1000-level stockroom). Stated there will be no organic labs in the annex.
- Chemistry Department likes the first annex option since there is access to a stockroom. The second option has an issue with the proximity to the stockroom. Connectivity between labs is better since labs are next to one another. This is good for emergencies and sharing equipment.
- Stantec stated that design will include 24 students per classroom, which results in 10, 12 or 14 classrooms in Options 1, 2, or 3 respectively.
- Stantec stated that both the lab and classroom could be located in the same room. Some smaller colleges use this design.
- Chemistry Department stated that if the classroom and lab are the same area, students will need to wear safety glasses at all times, which will be hard to enforce. Also, clean-up will be difficult from one session to the next especially if there are spills. It is better to keep the lab and classroom separate, especially for organic chemistry. Facilities Planning asked if it is problematic if the

classroom and lab are combined. Stantec stated it is better to have a partition and doors. Chemistry Department prefers separate labs and classrooms, separated by glass so students can see their belongings. Having windows on the doors will be a good security item. Having door access to both lab and classroom will help handicapped students.

- Stantec stated there are bench hoods currently. An option includes snorkels but these obstruct site lines. Chemistry Department stated that sulfuric acid is the strongest chemical introductory classes use, which is not very volatile but pungent. Ventilation is needed at bench top, but not needed continuously. Three people in a seven-foot hood will provide the student more space, or possibly four people per eight-foot hood. Snorkels may be the best solution since they don't always need hoods. Stantec stated that four people per fume hood means six fume hoods plus two feet which equals 50 linear feet in total. Stantec stated that there could be one snorkel per pair. Chemistry Department asked if snorkels pull the same amount of air as the current hoods. Designer replied that the snorkels would pull significantly less than the hoods. Stantec stated that snorkels are not to be used for toxic materials.
- Chemistry Department stated that Sections 1203 and 1204 (nursing chemistry) deal with organics, so will need more in terms of safety. This could include a combination of one lab with hoods and another with snorkels.
- Stantec stated there will be 3 labs with bench hoods for students as opposed to perimeter hoods. Bench hoods are 18 inches high. If snorkels are used, the bench can be cleared. There is not much difference in cost between snorkel and bench hoods. The bench may have a marine edge dished out to help contain fires.
- Chemistry Department wants: (1) bench top hoods with glass- back bench hoods (2) fume hoods, three in all, and (3) dished surface on bench.
- Organic Labs:
    - Stantec stated that the entire bench space is a hood, with glass on sides and back with a metal frame. One can see through when back to back.
    - Chemistry Department indicated the need for fire cabinets, must accommodate 24 students with hood allocation for a student or a pair of students. If it is a back to back configuration, then students could do everything needed in the hood.
    - Stantec said a six-foot long hood will be enough for two students. The common depth of the hood is 32 or 36 inches.
    - Chemistry Department mentioned the utility needs include electricity, water, steam and natural gas (roll in tanks). Likes glass backed bench hoods.
    - Stantec mentioned that the current trend is for actual fume hoods on the perimeter of the room, and maybe the entire bench space is hooded.
    - Chemistry Department mentioned that bench hoods aren't needed, just six total fume hoods. Pumps are better than aspirators.
    - Stantec asked many organic labs are needed. Chemistry Department said four are needed in terms of long range.
    - Chemistry Department said that Option 2 will include three organic chemistry labs. In the long term (past year 2020), four are needed. In Option 3 (annex), more space for researchers will be needed in the future. Organic labs might be added into the addition. There is a benefit to having research groups together and not spread out.

- Physics:
    - Undergraduate courses are taught in Burson, and Graduate courses are taught in Grigg.
    - The Physics Department stated that it doesn't need more lab teaching space in Burson right now. Dr. Boreman believes Physics will expand 12% to15% in student size. If Physics could get a smaller space for the main office, some space could be given up

where the office is now. Right now the configuration of space works well. There is space to bring in some more tables.

- Stantec asked about potential for labs with octagonal tables. The Physics Department states that most of those labs moved to Grigg (Graduate level). Most experiments are basic; they are force experiments which interface with computer system modules.
- Physics Department stated that IMAX computers are replaced every 3 years, and are all in one network.
- Stantec asked if there are any services lacking, such as compressed air. Physics Department stated no, these are basic courses.
- Physics Department will send Stantec the lab schedule.
- Physics Department stated that work on a portion of Lab 114 (Astronomy Lab) was just finished. This is now used.
- Physics Department stated that the rooftop isn't used, and that students go to observatory, but will check to be certain.
- Physics Department stated that Room 76 is the Physics Resource Center, which includes computers.
- Physics Department stated that there is more than enough space in the stock room. The stockroom between the labs is used frequently. The one across the hall does not get much use.
- Stantec asked if small instrument rooms are good or would it be better to have one single room (such as Rooms 153A, B, and C)? The Physics Department stated that they don't get used for any lab purpose, just pass-through with some storage. Stantec stated that the best use would be to open the room and create more storage. Physics Department stated the need for access to the main stockroom.
- Stantec stated that Rooms 118 and 116 are labeled Physics, is that correct? Chair stated that Physics gets first selection on scheduling but if they don't need it, others use it.
- Physics Department said that Room 121 is the main room that Physics uses for teaching. Stantec stated that we could build into Room 117, making Room 121 larger.
- Facilities Planning stated that there needs to be additional conversation regarding Physics providing space to Chemistry.
- Physics Department stated that HVAC is the main issue, since the labs are very warm. May consider renovating Room 121 (rotating stage) to make the room more efficient. The AV/projector room could be removed, which is the case in all the lecture halls. Room 117 can be renovated and has no current use.
- Chemistry Department noted that Room 117 has a steeply sloped entrance. The Chair asked if there is any interest in using the stage. The Physics Department stated that it's not being used since there are many items stacked around it. The Chair stated that an option is to build into it and make Room 117 a larger lecture room. There is a hood behind Room 115. If Room 115 got extended to Room 117, then the hood can be utilized.
- Stantec stated that if introductory labs were put in the annex, then conversion from Physics Labs to Chemistry Research could happen.
- Chair mentioned a 15% growth in Physics. How long will that be adequate? Physics Department stated that space should continue to be sufficient in Burson, but will verify.
- Facilities Planning stated that for the annex, will need a certain number of ADA parking spaces, and will find out how many are needed.
- Chemistry Department: For the loading dock, space is needed for a dumpster, recycling and access to mechanicals. Tractor-trailer access is not needed. The stockroom takes deliveries from UPS. The best position for a box truck access is located on the side of the building, potentially using a hammerhead turn. Facilities Planning stated that there is no

campus requirement for a loading dock but it would be shortsighted to say we don't need one.

The foregoing is considered to be a true and accurate record of all items discussed. If any discrepancies or inconsistencies are noted, please contact the writer immediately.

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Bert Evans, Stantec
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Grounds and Chemistry Administration Meeting

Date/Time: July 17, 2013 / 9:00 AM- 11:30 AM
Place: UNC-Charlotte Burson Building, Room 239B

Attendees: Dr. Bernadette Donovan-Merkert (bdonovan@uncc.edu), Jon Merkert (jmerkert@uncc.edu), Michael Reagan (michael.reagan@stantec.com), Rob Stout (rob.stout@stantec.com), Dewey Williams (williams@uncc.edu), Bridget Painter (bridget.painter@stantec.com), Craig Fox (crfox@uncc.edu), Laurie Manderino (lmanderino@uncc.edu), Lisa Carlin (ljcarlin@uncc.edu), Robin Burns (robinburns@uncc.edu), Caroline Kennedy (cekenned@uncc.edu)

Following are the main items discussed during the meeting:

Conversation with Grounds Department:

- Chilled water pumps are undersized and pipe size is limited, so just increasing the size of the pump is not an option. There are two new make-up air units that don't run due to high humidity.
- Grounds said much can be solved with an energy wheel (Woodward Hall has one).
- Burson receives on-campus steam. There is a plan to eliminate on-campus steam. Grounds said there will be satellite boilers, not centralized.
- Stantec asked if it is possible to take down parts of the building, and Grounds answered that there is only one air handler for the building.
- Grounds stated that electrically, may want to have a few transformers upsized but there are currently no full panels. Chair stated that the placement of panels reduces research lab space and back-up power. Grounds stated that the new building panels are in the hallway. All panels in this building are up to date. The electrical system is mostly original with some replacement. There are no significant electrical problems. The Chemistry Department stated that panel locations and back-up problems exist.
- Chair stated that older labs need new lighting. Grounds replied that this is already being phased in, so it would not be a part of this project.
- There are small HVAC systems that need replacement, which are R-22. Chemistry Department said that there are two on the roof, one by the loading dock, one on the other end of Physics, one in Room 227 and one in the dungeon. They are R-22 systems and will need to be replaced.
- Stantec asked if there are campus humidity control standards. Grounds doesn't think there are any; just temperature control. Some labs would like individual temperature and humidity control.
- Chemistry Department asked if the exhaust fans are original. Grounds replied that 10 to 15 motors are replaced in a 6 month period. There are 208 exhaust fans/ 120 motors. Some fans share motors. They need frequent replacement because of the environment they are in, a lot of heat and moisture. Motors should be in air-conditioned spaces.
- Chemistry Department mentioned there is a water pressure issue.
- Stantec said there is a transformer and abandoned pad between Burson and Cameron. Grounds believes the transformer is active.
- Capital mentioned there is a design for Craver Road which may include some bus turn outs and features. It is a conceptual design.
- Tom Sparks will need the load capacity for the addition. Stantec will determine the load capacity and send the information to Tom Sparks.

- Stantec asked if there is a policy on campus regarding parking under buildings. It is a possibility to put something underneath. Some universities prevent underground parking as a car bombing preventative.
- Grounds mentioned there may be an issue with bedrock. Stantec asked if Geotechnical information be available from the adjacent building. Grounds asked that Stantec send an email and someone will respond to the question about the Geotechnical report.
- Grounds mentioned that the cooling tower is at capacity.
- Chemistry Department mentioned that the stockroom has three purposes:
    - Receiving for the building- need a separate space for a desk and computer, and a place for UPS to put boxes. Large pieces will typically be delivered directly to or close to the space they are going.
    - Lab prep work- currently uses Room 123 which is small and not adequate. There is one small hood (6 or 5 feet in length) which is currently adequate but many solutions must be inside the hood. Could expand into Room 225. About 324 square feet would be best for a lab preparation area.
    - Storing chemicals for research and storage for glassware equipment. Additional flammable space and acid space storage are needed. Two acid, one basic and two flammable storage cabinets are needed now, but will need more in the future. There are sufficient locking storage cabinets. Chemistry Department stated that there are also wooden cabinets with shelving that are starting to be inadequate. Cabinets are only piecemealed and some are falling part. Stantec will need the linear footage of shelving for supplies and equipment. Chemistry Department will let the group know of the exact cabinet depth needed.
- Stantec asked if it is acceptable to have two service windows, one teaching and one research. Chemistry Department said yes and prefers to decrease traffic in the areas. Chemistry Department said the prep room needs more bench space and hoods.

Conversation with Chemistry Administration

- Chair mentioned that the Senior Associate Provost spoke about expanding the office space.
- Chemistry Department said that people have difficulty finding the office. The numbering system does not help; the Chair said the signage will help.
- Administration indicated more kitchen space is needed.
- Chair said that preserving the windows is a key factor. The Chair would like to be able to keep a conference table in her office.
- Administration would like "U" shaped cubicles with half walls and would also like to have a small reception area so visitors can be met. The total need is four desks and four cubicles. The work room and storage room can be combined. The Chair's office should be protected from noise. Stantec said a sound seal and an acoustic wall on the main office, chair's office and bathroom can be constructed.
- Chair would like to not be visible to everyone that comes in the office. Stantec said the Senior Associate Provost recommended separating the students from the faculty.
- Stantec said there could be a student function office downstairs and department upstairs. Chair said that may be complicated and doesn't want the Chair's office to be remote.
- Administration mentioned that the four administration individuals have four different functions: one works with grad students, one works with undergraduate and faculty, one works with purchasing and receiving and one more person is currently being hired and does not have a job description.

- Administration said that faculty offices and administrative offices should be on the outside of the building, which will reduce odors encountered. Chair mentioned that the women's restroom has poor air circulation.
- Stantec asked that if in the future the research gets moved to the new building, what are the requirements? Chair answered there would be a one to two staff. That would be where the exams would be run off and advisors would be located but it is unclear how the faculty would split. Faculty should be located in one building but an advisor would need a space. In terms of purchasing and faculty, all would go into the new building including the Chair's office (just hotel space).
- Stantec stated that because of the location of the Student Union, the new Burson entrance should be located on the front Student Union side.
- Chair discussed breaking down walls in Rooms 111, 112, and 113 to make a small kitchen area. Room 120 is used for a lunch room, also. Also needed is a meeting room for faculty and staff which holds approximately 30 people.
- Chemistry Department wants to keep faculty offices where they are, but needs more offices.
- Chair mentioned that there is no place for students to have lunch. There currently is a 2^{nd} floor student lounge but it is only for the graduate students. Students can go to the reading room to eat but would prefer a separate space for undergrads to eat. Stantec said that the reading room could be split to separate eating and reading.
- Chair said that a larger kitchen on the first floor is preferred with a place to cook (microwave or oven). Administration said that a kitchen area upstairs wouldn't be needed if there was a big kitchen downstairs. Also, if there were a bigger meeting area downstairs, it would be nice to have a kitchen area there. Chair said that a coffee area would be nice in the large conference room.
- Capital mentioned not to forget about janitorial space needed.
- Chemistry Department said that the downstairs restrooms need updating, and Stantec mentioned that is one of the items that must be brought up to code.
- Chemistry Department needs an area in the annex for the students to shower in private, which doesn't need to consume a lot of area. There are safety showers in the labs but also needed is a private shower.
- Chair Action Items: We will let Stantec know how many freshmen labs and organic labs we will need according to growth.
- Chemistry Department Action Item: Will send Stantec the linear storage information and will generate a report from Archibus.

The foregoing is considered to be a true and accurate record of all items discussed. If any discrepancies or inconsistencies are noted, please contact the writer immediately.

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UNC-Charlotte Burson Building Feasibility Study- Programming Session #3

Chemistry and Physics Department Meetings

Date/Time: August 8, 2013 / 8:00 AM- 11:00 PM, 1:00 PM- 2:30PM
Place: UNC-Charlotte Burson Building, Room 239B

Attendees: Dr. Bernadette Donovan-Merkert (bdonovan@uncc.edu), Jon Merkert (jmerkert@uncc.edu), Joe Loder (jloder1@uncc.edu) , Dewey Williams (williams@uncc.edu), Jay Raja (jraja@uncc.edu), Casi Shepardson (clshepar@uncc.edu); Scott Williams (scotwill@uncc.edu), Michael Reagan (michael.reagan@stantec.com), Rob Stout (rob.stout@stantec.com), Jim Eyth (jim.eyth@stantec.com) , Tom Phelps (tom.phelps@stantec.com)

<u>Following are the main items discussed during the meeting:</u>

- It was agreed two options would be described in the study including:
    - Option 1 – HVAC system replacement, other electrical/plumbing system improvements and renovations to create 2-3 additional teaching labs and 1-2 additional research labs.
    - Option 2 – New addition plus HVAC system replacement, other electrical/plumbing system improvements and renovations to create 1-3 additional teaching labs and 1-2 additional research labs.
- It was agreed that as a result of the required supervision, access to similar instruments and equipment, and similar supplies, that all 1000 level General Chemistry teaching labs as well as the Organic Chemistry teaching labs must remain together whether they move temporarily or permanently. Also, organic labs must stay together.
- Many existing hoods are broken and are no longer fireproof.
- It was suggested one option would be to relocate some or all of Physics to the first floor of the Cameron Building should available space exist.
- Utilizing temporary laboratory modular units was discussed and the question of certification was raised. It was agreed that certification is based on what is taught and certification does not consider the facilities in which the content is taught.
- One issue with adding the temporary modular units to the Burson parking lot is the parking charges that will be incurred due to the parking spaces that will be taken out of service. Casi will contact JoAnn Fernaldo with Parking Services about the impacts.
- Teaching and research labs should go to the temporary modular units. Some research labs could go to the first floor.
- When taking down and working on the second floor renovations, it is important to minimize disruptions to first floor plumbing, etc. Services may need to be surgically transferred.
- Tom Sparks should be involved in the State Construction aspect of the HVAC equipment on the roof, regarding competitive bidding.
- Chemistry teaching lab diagrams were reviewed and it was agreed that paired teaching labs sharing a common instrument room are preferred to paired teaching labs with contiguous classrooms that could be combined into a larger room.
- Various addition options were reviewed and it was agreed that the preferred option should include a 200 person lecture hall. Jay Raja indicated the 200 person lecture hall should have a flat floor to maximize flexibility and to provide a unique venue for collaborative classroom functions on the

campus. It was agreed this room would be similar to other classrooms such as those created by North Carolina State University's Student-Centered Active Learning Environment for Undergraduate Programs (SCALE-UP) classroom or MIT's Technology Enabled Active Learning (TEAL) classroom. (Postscript - Students sit in three groups of three students at 6 or 7 foot diameter round tables. Instructors circulate and work with teams and individuals, engaging them in Socratic-like dialogues. Each table has at least three networked laptops. Additionally, each table may have a dedicated projection screen to display work. The setting is very much like a banquet hall, with lively interactions nearly all the time. Many other colleges and universities are adopting/adapting the SCALE-UP room design and pedagogy.) Stantec will also develop an option that shows 2 tables per tier in this lecture hall.

- If the building is used for other purposes in the future, this could reduce the need for current air handling capacity (for example, moving from labs/hoods to just classrooms). In this case, essentially the same air handler could be used, would just need to put a partition through the air handler.
- It was also agreed that Organic Chemistry Teaching labs should be located in the addition for Option 2.
- The existing elevator is to be updated. A new exterior elevator should also be taken into account.
- Since Bio Chemistry and Quantitative Chemistry are taught at different times, it was suggested that a single teaching lab could be used if it were properly designed.
- In Option 3C, include an expansion for the stockroom 20 feet to the right. Also, biochemistry shouldn't be moved to the 2nd floor.
- Include the proposed bus turnout along Craver Road on the site plan.
- Room 110 periodically experiences leakage from the outside due to heavy rains. Correcting this issue should be included in the planning level opinion of construction costs.
- Note that IT hasn't been involved in the process to date. IT may need a small room on the first floor.
- To create additional chemistry teaching spaces, it was proposed to convert the two Physics labs, Room 153 and Room 151, into Chemistry Teaching labs. The offices in Rooms 164 D-G, adjacent Resource Lab and Stock room, could be reconfigured into a Physics teaching lab if the office occupants could be accommodated in the Rooms 100, 102, 103, 104, 105 office suite. Other spaces in Cameron may be available to accommodate Physics such as the Metrology lab. Physics would prefer to seat 30 students in teaching labs that currently accommodate 24 students.
- It was suggested to renovate most of Room 117 into a faculty conference room or faculty offices while retaining some portion for Chemistry Lecture prep.
- It was suggested to combine Rooms 111 and 112 into a break room with a kitchenette.
- It was agreed to replace all bench-top exhaust canopies with glazed student fume hoods in all existing and new chemistry teaching labs.
- NMRs are difficult to move and should be kept running in place.
- A new organic lab should be located close to the new stockroom in the annex.
- Research labs need card swipes.
- Seven foot long hoods for two students are needed in Organic Chemistry. For General Chemistry, five to six foot long hoods are needed for two students.
- Need to maintain/create space on the roof for observatory, near an elevator for ADA access. A storage room on the roof for telescope mounts is preferable.
- For Room 121, there are many complaints about the rotating stage. It is not needed.
- For Room 100, there is significant wasted space; this is space that can be given to Chemistry.

- UNC-Charlotte Actions Items:
    - Determine requirements for accessible parking that will require relocation for Option 2. All on-street parking will be eliminated on Craver Road in the future.
    - Physics Department representatives to review possible relocation options.
    - Dewey to provide sketch for J. Troutman lab reconfiguration.

- Stantec Action Items:
    - Correct floor plans to indicate bench-top exhaust canopies in Room 202.
    - Contact Tom Sparks at UNC-C regarding packaged AHU's.
    - As part of scope of work, include disruptions to first floor occupants due to second floor plumbing drain relocations.
    - Highlight energy conservation measures as positive benefit for Options 1 & 2.
    - Include benefits of temporary laboratories' availability for other projects on the UNC-C campus after Burson is renovated.
    - Show new elevator in Addition in Option 2.
    - Refurbish existing elevator in Option 1 & 2.
    - Consider adding an elevator at Burson SW corner.
    - In Option 1 & 2, include repairs needed to address waterproofing damage at Burson SE corner (Room 110).
    - Include proposed Craver Road modifications on site plan for Options 1 and 2.
    - Show seating in Lecture Halls in Burson.
    - Reconfiguration of Chemistry Admin offices should include a corridor through Room 218. Locate file room adjacent to Chair office for acoustic buffer.
    - Add kitchenette with partition on Reading Room 237.
    - Correct name for Room 210B is "Students".
    - Indicate reconfiguration of seating in Room 121 to match 110 with approx. 150 seats (need to maintain ADA access to lower level).
    - Include new elevator to roof in Options 1 & 2 for ADA access to Observation deck.
    - Provide lockable storage on roof for Astronomy Equipment.
    - Develop an option that shows 2 tables per tier in 200 person lecture hall.

- Schedule:
    - Week of August 19th- Meet to discuss alternatives then.
    - Week of September 9th- Meet to discuss draft report and rehearse presentation. Note that Bernadette will not be available on September 9th and 10th.
    - Week of September 23rd- Presentation to Chancellor.

The foregoing is considered to be a true and accurate record of all items discussed. If any discrepancies or inconsistencies are noted, please contact the writer immediately.

STANTEC CONSULTING SERVICES INC.

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Eddie Porcher, Stantec
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Keith Bradley, Stantec

UNC-Charlotte Burson Building Feasibility Study- Executive Summary- Alternatives Review

Date/Time: September 11, 2013 / 8AM- 10AM and 1:30PM- 2:30PM
Place: UNC-Charlotte Cone Building, Room 311

Attendees: Dr. Bernadette Donovan-Merkert (by phone) (bdonovan@uncc.edu), Jon Merkert (jmerkert@uncc.edu), Joe Loder (jloder1@uncc.edu), Dewey Williams (williams@uncc.edu), Dr. Jay Raja (jraja@uncc.edu), Tom Sparks (tcsparks@uncc.edu), Scott Williams (scotwill@uncc.edu), Casi Shepardson (clshepar@uncc.edu), Lee Beard (lbeard@uncc.edu), Chris Gilbert (cgilbert@uncc.edu), Nancy Gutierrez (ngutierr@uncc.edu), Bill Hill (bjhill@uncc.edu), John Fessler (jafessle@uncc.edu), Phil Jones (pmjones@uncc.edu), Michael Reagan (michael.reagan@uncc.edu), Rob Stout (rob.stout@stantec.com), Jim Eyth (by phone) (jim.eyth@stantec.com), Bert Evans (bert.evans@stantec.com), Keith Bradley (keith.bradley@stantec.com)

Following are the main items discussed during the meeting:

- Stantec reviewed the main options.
- Must fume hoods be replaced? Currently, fume hoods include wood and are not fire proof. Also, current fume hoods have no energy savings potential.
- Concern over the estimated cost per square foot was raised. Stantec mentioned that the cost will be higher for renovating than building new, which is primarily due to the efforts needed to remove old materials (eg HVAC) and install new.
- Will all mechanical, including ductwork need to be replaced? Yes, the current ductwork is ineffective, with significant leakage.
- Construction for Option 2B (no modulars) would last approximately three years, while Option 1 construction would last about two years.
- Phil Jones was concerned over the intent of the study. Phil Jones believed that the intent was to have an interim solution for 5-7 years until the Science Building is constructed, and doesn't believe the magnitude of funds discussed in Options 1 and 2 will be appropriated in the near-term.
- Some attendees believed that the current HVAC system could be patched in the interim while other attendees believed that patches haven't worked in the past and that patches leave no room for growth.
- Dr. Donovan-Merkert mentioned that there is a need to hire one research position per year for the next few years, and that other items need to be addressed, such as the leaking roof.
- Phil Jones stated that in order to finalize the study, a much cheaper option (called Option 3 from here forward) should be presented that fixes the building's primary issues. The solutions may need to be phased over time.
- With Option 3, it can be safely assumed that Astronomy will be moved out of the Burson Building, and Physics can be moved out of the building over time (assuming buy-in from the Physics Department). Also, with Option 3, Dr. Raja wants Stantec to add three research labs and two teaching labs.
- A few participants left the meeting. A reduced group discussed Option 3 more specifically. The main components of Option 3 should include:

- An additional three Research Labs and two Teaching Labs, added over a 5-year period.
- New exhaust system.
- Fix the leaking roof.
- Fix structural items such as leakage into classrooms from outside walls.
- Do not include snorkels as solutions, as they are not as flexible as fume hoods.
- Fix leaking ductwork.
- Add humidity controls.
- For new Research Labs, a 6-foot long fume hood, power, DI water and gas are needed. Each lab will need to be 500 square feet each (standard for new researchers).
- For new Teaching Labs, three 6-foot long fume hoods plus benchtop hoods for 24 students are needed. Utilities needed include power, DI water and gas.
- A backup emergency generator.
- Upgrade the temperature control system.
- To minimize shutdown times while working on the HVAC system, six construction crews could work concurrently on the HVAC, breaking it down into six sections (one section per crew).
- To evaluate air loss, Stantec will need a Test and Balance (TAB) report. It is assumed that much of the ductwork will need to be resealed.
- Tom Sparks will check on the coils for the air handling unit to determine condition.
- Need a Phoenix-type lab pressurization control system.

- It was asked if SCO will require UNC-Charlotte to add fire sprinklers. The answer was unknown by the group, could be included as an add-alternate to the other work.

The meeting adjourned at 2:30 PM.

The foregoing is considered to be a true and accurate record of all items discussed. If any discrepancies or inconsistencies are noted, please contact the writer immediately.

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Chris Gilbert, UNC-Charlotte
Nancy Gutierrez, UNC-Charlotte

Bill Hill, UNC Charlotte
Joe Loder, UNC- Charlotte
Tom Sparks, UNC-Charlotte
Scott Williams, UNC-Charlotte
Michael Reagan, Stantec
Jim Eyth, Stantec
Tom Phelps, Stantec
Keith Bradley, Stantec
Bert Evans, Stantec

UNC-Charlotte Burson Building Feasibility Study- Programming Session #4 and Alternatives Evaluation

Date/Time: August 22, 2013 / 8AM- 3PM
Place: UNC-Charlotte Burson Building, Room 239B

Attendees: Dr. Bernadette Donovan-Merkert (bdonovan@uncc.edu), Jon Merkert (jmerkert@uncc.edu), Michael Reagan (michael.reagan@uncc.edu), Rob Stout (rob.stout@stantec.com), Jim Eyth (jim.eyth@stantec.com), Bert Evans (bert.evans@stantec.com); Keith Bradley (keith.bradley@stantec.com), Tom Phelps (tom.phelps@stantec.com), Joe Loder (jloder1@uncc.edu), Dewey Williams (williams@uncc.edu); Dr. Jay Raja (jraja@uncc.edu); John Blas (jblas@uncc.edu), Tom Sparks (tcsparks@uncc.edu), Lee Snodgrass (nsnodgra@uncc.edu), Scott Williams (scotwill@uncc.edu)

Following are the main items discussed during the meeting:

General Discussion (8am-10am Session)

- Some options to gain space: 1- move Astronomy lab to nearby Cameron building, and 2- move two calculus-based Physics labs to the Grigg building.
- Stantec reviewed the floorplans of Options 1 and 2 with the group. The group favored the open spaces shown on the Annex floorplans.
- The question was posed about extending the Annex towards the Cameron building. Stantec stated that this would be difficult because of the emergency generator and other utilities in the area.
- Currently, for the research labs, students perform all work within the labs, leaving no separation between lab work and other work. Having this separation is important.
- The University stated that it should be made clear in the report that new equipment will provide energy savings over time.
- Casi to provide parking costs for displaced parking to Stantec.
- Stantec to include parking costs in the overall project costs.
- Stantec to include as part of renovation scope new seating, new lighting, new finishes including acoustical treatments for all classrooms in both Option 1 and Option 2. Stantec will also include conversion of projector room into seating in Room 110.
- Renovations to include a new ice machine for Chemistry, as well as Physics.
- Renovations will include conversion of two Physics teaching labs into a Chemistry Teaching lab that will be used for Inorganic/Structures/ Organic Chemistry.
- Renovations for Biochemistry lab to include removal of partition to expand the Teaching lab.
- Vacated Physics teaching Labs will be renovated into classrooms and/or offices in Option 2.
- New elevator to be added in both Options 1 and 2.
- Stantec to update Site Plan to reflect proposed bus turn-out (under design by Kimley-Horn) on Craver Road.
- Stantec to revise pairs of Chemistry Teaching Lab Support Rooms as a single room.

- Stantec to capture in the final report all remaining deficiencies for both Options 1 and 2 such as lack of growth space for existing faculty research, new hires, additional student space in teaching labs, etc.
- Stantec to include project cost factors to all costs (approx. 30% of total costs).

MEP/IT Discussion (10am- Noon Session)

- IT: new cabling for computers is required throughout the building. IT will also need space on the 1st floor. The IT HVAC system is self-contained.
- Stantec will indicate IT closet locations, approximately 8 feet by 8 feet.
- Exhaust stacks to be shown on rendering.
- Exhaust fans will need to be included in sizing the emergency generator.
- Stantec to include description of crane size required to replace new rooftop equipment in future for Options 1 and 2.
- Costs for rooftop mechanical equipment screening should be included in costs.
- The existing observation deck will continue to be used unless new observation platform on grade is constructed adjacent to existing observatory.
- Stantec presented HVAC options. A penthouse would expedite construction significantly. There are options regarding the penthouse construction material. One concern with a penthouse is leakage associated with the access panels.
- Casi would like to include some wayfinding costs for Option 1, to direct students to access points along Burson, walking from Craver Road.
- The University wants Stantec to include costs for replacing the electrical switchboards.
- For the emergency generator, typically a 24-hour diesel storage is needed. Diesel is preferred to natural gas since diesel is a non-interrupted supply.
- The University wants any potable water backflow preventers to be located in a mechanical room with a drain. For a fire line, it’s acceptable to include a DCVA outside (in a vault in the ground).
- Duplicate boilers and chillers will need to be included for redundancy.
- There are no acid neutralization tanks in the existing Burson building.

Physics Discussion (1pm-3pm Session)

- Astronomy will not be able to be moved to the Grigg building, but could be moved to the Cameron building or a trailer.
- For the Physics office in Burson, may just have hotel space consisting of six cubicles for faculty and four cubicles for teaching assistants.
- The resource room could be somewhat smaller, would like 20-30 seat breakout rooms.
- A 150 seat lecture room is acceptable.

The meeting adjourned at 3:00 PM.

The foregoing is considered to be a true and accurate record of all items discussed. If any discrepancies or inconsistencies are noted, please contact the writer immediately.

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Appendix B
Estimate Detail

				Vermeulens		
		Vermeulens	Status			
Option	Option Description	Option Value	(P, A, R)	Pending	Accepted	Rejected
1	Option 1: Snorkel Exhausts in lieu of glass fume hoods at the student stations in each of the teaching labs (56 count)	($728,000)	p	($728,000)	$0	$0
2	Option 2: Snorkel Exhausts in lieu of glass fume hoods at the student stations in each of the teaching labs (104 count)	($1,352,000)	p	($1,352,000)	$0	$0
3	Temporary: Snorkel Exhausts in lieu of glass fume hoods at the student stations in each of the teaching labs (48 count)	($624,000)	p	($624,000)	$0	$0
4	Cost premium for full basement in lieu of partial basement	$1,066,917	p	$1,066,917	$0	$0
5	Cost to fit-up basement with research labs (16,000 NSF)	$3,335,410	p	$3,335,410	$0	$0
6	Phase 2.1 - renovate and repurpose 6,694 NSF to chemistry in lieu of physics	$602,460	p	$602,460	$0	$0
7	Phase 2.2 - renove and repurpose 4,797 NSF to chemistry offices and temporary physics offices in lieu of chemistry labs	($575,640)	p	($575,640)	$0	$0
8	Description	$0	p	$0	$0	$0
9	Description	$0	p	$0	$0	$0
10	Description	$0	p	$0	$0	$0

September 5, 2013

Stantec
400 Morgan Center
101 East Diamond Street
Butler, PA 16001-5923

Attention: Jim Eyth

Re: University of North Carolina at Charlotte – Burson Building Renovation

Dear Jim,

Please find enclosed our draft cost estimate for the above project based on preliminary design documents.

	Area (sf)	$/sf	$,000's
Renovations	103,662	83	8,588
Addition	59,801	195	16,558
Temporary Lab Space	49,140	165	8,123

This estimate includes all architectural direct construction costs, design and construction contingencies. Cost escalation assumes current rates.

Excluded from the estimate are: hazardous waste removal, mechanical and electrical scope, general contractor's overhead and profit, loose furnishings and equipment, project contingency, architect's and engineer's fees, moving, administrative and financing costs.

Bidding conditions are expected to reflect one construction manager, open bidding for sub-contractors, open specifications for materials and manufacturers.

The above rates are order-of-magnitude (within 15% of later estimates based on detailed design information) for the purpose of program sizing and prioritization only.

If you have any questions or require further analysis please do not hesitate to contact us.

Yours very truly,

James Vermeulen, PQS
Co-CEO

LEVEL 2 ELEMENTAL SUMMARY	$/sf	Element $	%	Reno		New		Temporary (18 mos)	
GROSS FLOOR AREA		237,603 sf		$/sf	103,662	$/sf	84,801	$/sf	49,140
A1 SUBSTRUCTURE	2.88	683,885	2%	0.10	10,000	7.95	673,885	0.00	0
A2 STRUCTURE	12.00	2,851,678	9%	3.39	351,817	29.48	2,499,861	0.00	0
A3 ENCLOSURE	17.40	4,133,379	12%	11.68	1,210,620	34.47	2,922,759	0.00	0
B1 PARTITIONS & DOORS	6.65	1,579,000	5%	1.87	193,750	16.34	1,385,250	0.00	0
B2 FINISHES	13.20	3,135,689	9%	10.66	1,104,696	23.95	2,030,993	0.00	0
B3 FITTINGS & EQUIPMENT	31.91	7,582,736	23%	36.79	3,813,512	44.45	3,769,224	0.00	0
D1 SITE WORK	3.16	750,000	2%	0.00	0	8.84	750,000	0.00	0
D2 ANCILLARY WORK	30.96	7,355,994	22%	4.55	471,894	0.00	0	140.09	6,884,100
DIRECT CONSTRUCTION COST	118.15	28,072,360	84%	69.03	7,156,289	165.47	14,031,971	140.09	6,884,100
Z1 GENERAL REQUIREMENTS	0.00	0	0%	0.00	0	0.00	0	0.00	0
Z2 CONTINGENCIES	21.87	5,196,151	16%	13.81	1,431,258	29.78	2,525,755	25.22	1,239,138
TOTAL CONSTRUCTION COST	140.02	33,268,510	100%	82.84	8,587,547	195.25	16,557,725	165.31	8,123,238

ELEMENTAL SUMMARY	Level 3 Element $	$/sf	Reno		New		Temporary (18 mos)	
GROSS FLOOR AREA			$/sf	103,662	$/sf	84,801	$/sf	49,140
A1 SUBSTRUCTURE								
A11 Foundations	394,855	1.66	0.10	10,000	4.54	384,855	0.00	0
A12 Building Excavation	289,030	1.22	0.00	0	3.41	289,030	0.00	0
A2 STRUCTURE								
A21 Lowest Floor Structure	193,178	0.81	0.01	750	2.27	192,428	0.00	0
A22 Upper Floor Structure	2,085,620	8.78	2.81	291,067	21.16	1,794,553	0.00	0
A23 Roof Structure	572,880	2.41	0.58	60,000	6.05	512,880	0.00	0
A3 ENCLOSURE								
A31 Walls Below Grade	220,000	0.93	0.00	0	2.59	220,000	0.00	0
A32 Walls Above Grade	1,182,673	4.98	0.69	72,000	13.10	1,110,673	0.00	0
A33 Windows & Entrances	641,790	2.70	0.00	0	7.57	641,790	0.00	0
A34 Roof Covering	1,783,712	7.51	10.02	1,038,620	8.79	745,092	0.00	0
A35 Projections	305,204	1.28	0.96	100,000	2.42	205,204	0.00	0
B1 PARTITIONS & DOORS								
B11 Partitions	1,229,000	5.17	1.11	115,000	13.14	1,114,000	0.00	0
B12 Doors	350,000	1.47	0.76	78,750	3.20	271,250	0.00	0
B2 FINISHES								
B21 Floor Finishes	1,329,640	5.60	3.25	336,444	11.71	993,196	0.00	0
B22 Ceiling Finishes	1,052,699	4.43	5.00	518,310	6.30	534,389	0.00	0
B23 Wall Finishes	753,350	3.17	2.41	249,942	5.94	503,408	0.00	0
B3 FITTINGS & EQUIPMENT								
B31 Fittings	1,760,736	7.41	3.14	325,512	16.92	1,435,224	0.00	0
B32 Equipment	5,702,000	24.00	32.49	3,368,000	27.52	2,334,000	0.00	0
B33 Conveying Systems	120,000	0.51	1.16	120,000	0.00	0	0.00	0
D1 SITE WORK								
D11 Site Development	750,000	3.16	0.00	0	8.84	750,000	0.00	0
D2 ANCILLARY WORK								
D21 Demolition	471,894	1.99	4.55	471,894	0.00	0	0.00	0
D22 Alterations	6,884,100	28.97	0.00	0	0.00	0	140.09	6,884,100
DIRECT CONSTRUCTION COST			69.03	7,156,289	165.47	14,031,971	140.09	6,884,100
Z1 GENERAL REQUIREMENTS								

ELEMENTAL SUMMARY	Level 3 Element $		$/sf				Reno		New		Temporary (18 mos)	
GROSS FLOOR AREA							$/sf	103,662	$/sf	84,801	$/sf	49,140
Z11 General Requirements	0.0%	0	0.00				0.00	0	0.00	0	0.00	0
Z12 Fee	0.0%	0	0.00				0.00	0	0.00	0	0.00	0
Z2 CONTINGENCIES												
Z21 Design Contingency	15.0%	4,210,854	17.72				10.36	1,073,443	24.82	2,104,796	21.01	1,032,615
Z22 Escalation Contingency	0.0%	0	0.00				0.00	0	0.00	0	0.00	0
Z23 Construction Contingency	3.5%	985,297	4.15				3.45	357,814	4.96	420,959	4.20	206,523
TOTAL CONSTRUCTION COST				140.02	33,268,510	100%	82.84	8,587,547	195.25	16,557,725	165.31	8,123,238

ELEMENTAL ESTIMATE

Description	Trade	Quantity		Rate	$	Reno Quantity	Reno $	New Quantity	New $	Temporary (18 mos) Quantity	Temporary (18 mos) $
GROSS FLOOR AREA											
First Floor		77,488	sf			51,831		25,657			
Second Floor		77,475	sf			51,831		25,644			
Basement		8,500	sf					8,500			
Temporary		49,140	sf							49,140	
Penthouse		25,000	sf					25,000			
TOTAL GROSS FLOOR AREA		237,603	sf			103,662		84,801		49,140	

REPORT NOTES

ELEMENTAL ESTIMATE

Description	Trade	Quantity		Rate	$	Reno Quantity	Reno $	New Quantity	New $	Temporary (18 mos) Quantity	Temporary (18 mos) $
A1 SUBSTRUCTURE											
A11 Foundations											
Foundations											
foundations - assumes shallow	+	100	sf	100.00	10,000	100	10,000		0		0
foundations - assumes shallow	+	25,657	sf	15.00	384,855		0	25,657	384,855		0
Subtotal Foundations		25,757	sf	15.33	394,855	100	10,000	25,657	384,855	0	0
Total A11 Foundations		237,603	sf	1.66	394,855	0.10	10,000	4.54	384,855	0.00	0
A12 Building Excavation											
Earthwork											
compacted fill		7,600	cy	30.00	228,000		0	7,600	228,000		0
excavation and haul away for basement		2,520	cy	20.25	51,030		0	2,520	51,030		0
dewatering (minimal), obstruction removal		10,000	ls	1.00	10,000		0	10,000	10,000		0
Subtotal Earthwork					289,030	0	0	0	289,030	0	0
Total A12 Building Excavation		237,603	sf	1.22	289,030	0.00	0	3.41	289,030	0.00	0
TOTAL A1 SUBSTRUCTURE					683,885		10,000		673,885		0

ELEMENTAL ESTIMATE						Reno		New		Temporary (18 mos)	
Description	Trade	Quantity		Rate	$	Quantity	$	Quantity	$	Quantity	$
A2 STRUCTURE											
A21 Lowest Floor Structure											
On Grade											
slab on grade, finish, vapor barrier, house keeping pads, pits, pads, details	+	25,757	sf	7.50	193,178	100	750	25,657	192,428		0
Subtotal On Grade		25,757	sf	7.50	193,178	100	750	25,657	192,428	0	0
Total A21 Lowest Floor Structure		237,603	sf	0.81	193,178	0.01	750	2.27	192,428	0.00	0
A22 Upper Floor Structure											
Floor Structure											
concrete topping, metal deck, structural steel, fireproofing, expansion joints, etc	+	59,157	sf	29.00	1,715,553		0	59,157	1,715,553		0
minor cutting & patching	+	74,366	sf	0.50	37,183	74,366	37,183		0		0
cutting & patching & floor levelling	+	29,256	sf	1.50	43,884	29,256	43,884		0		0
structural upgrades to existing		200,000	ls	1.00	200,000	200,000	200,000		0		0
Subtotal Floor Structure		162,779	sf	12.27	1,996,620	103,622	281,067	59,157	1,715,553	0	0
Stairs, Miscellaneous											
egress stairs		4	no	11,000.00	44,000		0	4	44,000		0
miscellaneous metals		35,000	ls	1.00	35,000		0	35,000	35,000		0
miscellaneous metals @ full reno		10,000	ls	1.00	10,000	10,000	10,000		0		0
Subtotal Stairs, Miscellaneous					89,000	0	10,000	0	79,000	0	0
Total A22 Upper Floor Structure		237,603	sf	8.78	2,085,620	2.81	291,067	21.16	1,794,553	0.00	0
A23 Roof Structure											

ELEMENTAL ESTIMATE

Description	Trade	Quantity		Rate	$	Reno Quantity	Reno $	New Quantity	New $	Temporary (18 mos) Quantity	Temporary (18 mos) $
Roof Structure											
concrete topping, metal deck, structural steel, fireproofing, expansion joints, etc	+	25,644	sf	20.00	512,880		0	25,644	512,880		0
roof support for MEP equipment - allow		50,000	ls	1.00	50,000	50,000	50,000		0		0
roof structure at top of elevator shaft	+	100	sf	100.00	10,000	100	10,000		0		0
Subtotal Roof Structure		25,744	sf	22.25	572,880	100	60,000	25,644	512,880	0	0
Total A23 Roof Structure		237,603	sf	2.41	572,880	0.58	60,000	6.05	512,880	0.00	0
TOTAL A2 STRUCTURE					2,851,678		351,817		2,499,861		0

ELEMENTAL ESTIMATE					Reno		New		Temporary (18 mos)	
Description	Trade	Quantity	Rate	$	Quantity	$	Quantity	$	Quantity	$
A3 ENCLOSURE										
A31 Walls Below Grade										
Basement Walls										
basement walls	+	5,500 sf	40.00	220,000		0	5,500	220,000		0
Subtotal Basement Walls		5,500 sf	40.00	220,000	0	0	5,500	220,000	0	0
Total A31 Walls Below Grade		237,603 sf	0.93	220,000	0.00	0	2.59	220,000	0.00	0
A32 Walls Above Grade										
Cladding										
cladding - 60%	+	11,061 sf	45.00	497,745		0	11,061	497,745		0
against existing - see backup	+	9,450 sf	0.00	0		0	9,450	0		0
cladding for elevator shaft	+	600 sf	60.00	36,000	600	36,000		0		0
additional cladding at penthouse dormers	+	1,000 sf	45.00	45,000		0	1,000	45,000		0
Subtotal Cladding		22,111 sf	26.17	578,745	600	36,000	21,511	542,745	0	0
Backup										
lgmf backup system	+	12,061 sf	27.50	331,678		0	12,061	331,678		0
against existing	+	9,450 sf	25.00	236,250		0	9,450	236,250		0
backup for elevator shaft	+	600 sf	60.00	36,000	600	36,000		0		0
Subtotal Backup		22,111 sf	27.31	603,928	600	36,000	21,511	567,928	0	0
Total A32 Walls Above Grade		237,603 sf	4.98	1,182,673	0.69	72,000	13.10	1,110,673	0.00	0
A33 Windows & Entrances										
Windows										

ELEMENTAL ESTIMATE					Reno		New		Temporary (18 mos)	
Description	Trade	Quantity	Rate	$	Quantity	$	Quantity	$	Quantity	$
windows - 40%	+	7,374 sf	85.00	626,790		0	7,374	626,790		0
Subtotal Windows		7,374 sf	85.00	626,790	0	0	7,374	626,790	0	0
Entrances										
entrances - allow		5 no	3,000.00	15,000		0	5	15,000		0
Subtotal Entrances				15,000	0	0	0	15,000	0	0
Total A33 Windows & Entrances		237,603 sf	2.70	641,790	0.00	0	7.57	641,790	0.00	0
A34 Roof Covering										
Roofing										
roofing membrane	+	64,760 sf	20.00	1,295,200	51,931	1,038,620	12,829	256,580		0
pitched standing seam metal roof	+	14,368 sf	30.00	431,040		0	14,368	431,040		0
gutters, downspouts, etc		14,368 sf	4.00	57,472		0	14,368	57,472		0
Subtotal Roofing		79,128 sf	22.54	1,783,712	51,931	1,038,620	27,197	745,092	0	0
Total A34 Roof Covering		237,603 sf	7.51	1,783,712	10.02	1,038,620	8.79	745,092	0.00	0
A35 Projections										
Projections - Area Based										
allow		51,301 sf	4.00	205,204		0	51,301	205,204		0
allow for mechanical enclosure for new HVAC units		100,000 ls	1.00	100,000	100,000	100,000		0		0
Subtotal Projections - Area Based				305,204	0	100,000	0	205,204	0	0
Total A35 Projections		237,603 sf	1.28	305,204	0.96	100,000	2.42	205,204	0.00	0

ELEMENTAL ESTIMATE					Reno		New		Temporary (18 mos)	
Description	Trade	Quantity	Rate	$	Quantity	$	Quantity	$	Quantity	$
TOTAL A3 ENCLOSURE				4,133,379		1,210,620		2,922,759		0

ELEMENTAL ESTIMATE						Reno		New		Temporary (18 mos)	
Description	Trade	Quantity		Rate	$	Quantity	$	Quantity	$	Quantity	$
B1 PARTITIONS & DOORS											
B11 Partitions											
Partitions											
partitions	+	84,500	sf	12.00	1,014,000		0	84,500	1,014,000		0
partitions - reno	+	35,000	sf	2.00	70,000	35,000	70,000		0		0
partitions - existing, cut & patch as required	+	90,000	sf	0.50	45,000	90,000	45,000		0		0
Subtotal Partitions		209,500	sf	5.39	1,129,000	125,000	115,000	84,500	1,014,000	0	0
Railings											
railings	+	400	lf	250.00	100,000		0	400	100,000		0
Subtotal Railings		400	lf	250.00	100,000	0	0	400	100,000	0	0
Total B11 Partitions		237,603	sf	5.17	1,229,000	1.11	115,000	13.14	1,114,000	0.00	0
B12 Doors											
Doors, Frames, Hardware											
doors	*	200	no	1,750.00	350,000	45	78,750	155	271,250		0
Subtotal Doors, Frames, Hardware		200	no	1,750.00	350,000	45	78,750	155	271,250	0	0
Total B12 Doors		237,603	sf	1.47	350,000	0.76	78,750	3.20	271,250	0.00	0
TOTAL B1 PARTITIONS & DOORS					1,579,000		193,750		1,385,250		0

ELEMENTAL ESTIMATE					Reno		New		Temporary (18 mos)	
Description	Trade	Quantity	Rate	$	Quantity	$	Quantity	$	Quantity	$
B2 FINISHES										
B21 Floor Finishes										
Flooring										
new addition	+	53,821 sf	10.00	538,210		0	53,821	538,210		0
renovated space	+	29,256 sf	10.00	292,560	29,256	292,560		0		0
existing to remain	+	74,406 sf	0.00	0	74,406	0		0		0
moisture mitigation		53,821 sf	4.00	215,284		0	53,821	215,284		0
penthouse	+	25,000 sf	6.00	150,000		0	25,000	150,000		0
Subtotal Flooring		182,483 sf	6.55	1,196,054	103,662	292,560	78,821	903,494	0	0
Base										
base		89,057 sf	1.50	133,586	29,256	43,884	59,801	89,702		0
Subtotal Base				133,586	0	43,884	0	89,702	0	0
Total B21 Floor Finishes		237,603 sf	5.60	1,329,640	3.25	336,444	11.71	993,196	0.00	0
B22 Ceiling Finishes										
Ceilings										
new addition	+	53,821 sf	9.00	484,389		0	53,821	484,389		0
renovated space	+	29,256 sf	5.00	146,280	29,256	146,280		0		0
existing to remain - allow for removal and reinstall as required for HVAC modifications	+	74,406 sf	5.00	372,030	74,406	372,030		0		0
penthouse	+	25,000 sf	2.00	50,000		0	25,000	50,000		0
Subtotal Ceilings		182,483 sf	5.77	1,052,699	103,662	518,310	78,821	534,389	0	0
Total B22 Ceiling Finishes		237,603 sf	4.43	1,052,699	5.00	518,310	6.30	534,389	0.00	0

ELEMENTAL ESTIMATE						Reno		New		Temporary (18 mos)	
Description	Trade	Quantity		Rate	$	Quantity	$	Quantity	$	Quantity	$
B23 Wall Finishes											
Wall Finishes											
new addition	+	59,801	sf	8.00	478,408		0	59,801	478,408		0
renovated space	+	29,256	sf	6.00	175,536	29,256	175,536		0		0
existing to remain - allow to cut & patch	+	74,406	sf	1.00	74,406	74,406	74,406		0		0
penthouse	+	25,000	sf	1.00	25,000		0	25,000	25,000		0
Subtotal Wall Finishes		188,463	sf	4.00	753,350	103,662	249,942	84,801	503,408	0	0
Total B23 Wall Finishes		237,603	sf	3.17	753,350	2.41	249,942	5.94	503,408	0.00	0
TOTAL B2 FINISHES					3,135,689		1,104,696		2,030,993		0

ELEMENTAL ESTIMATE					Reno		New		Temporary (18 mos)	
Description	Trade	Quantity	Rate	$	Quantity	$	Quantity	$	Quantity	$
B3 FITTINGS & EQUIPMENT										
B31 Fittings										
Casework - Specialty										
lab casework		59,801 sf	16.00	956,816		0	59,801	956,816		0
replace benchtops		890 lf	300.00	267,000	890	267,000		0		0
Subtotal Casework - Specialty				1,223,816	0	267,000	0	956,816	0	0
Casework - General										
general casework		59,801 sf	2.50	149,503		0	59,801	149,503		0
Subtotal Casework - General				149,503	0	0	0	149,503	0	0
Specialties										
specialties - addition		59,801 sf	4.50	269,105		0	59,801	269,105		0
specialties - reno		29,256 sf	1.50	43,884	29,256	43,884		0		0
Subtotal Specialties				312,989	0	43,884	0	269,105	0	0
Furnishings										
furnishings - addition		59,801 sf	1.00	59,801		0	59,801	59,801		0
furnishings - reno		29,256 sf	0.50	14,628	29,256	14,628		0		0
Subtotal Furnishings				74,429	0	14,628	0	59,801	0	0
Total B31 Fittings		237,603 sf	7.41	1,760,736	3.14	325,512	16.92	1,435,224	0.00	0
B32 Equipment										
Equipment - Specialty										

ELEMENTAL ESTIMATE						Reno		New		Temporary (18 mos)	
Description	Trade	Quantity		Rate	$	Quantity	$	Quantity	$	Quantity	$
fumehoods - 8'		31	no	16,000.00	496,000	31	496,000		0		0
fumehoods - 6'		61	no	12,000.00	732,000	30	360,000	31	372,000		0
fumehoods - 5'		27	no	10,000.00	270,000	25	250,000	2	20,000		0
fumehoods - 4'		8	no	14,000.00	112,000	8	112,000		0		0
fumehoods - 6', glass student		42	no	20,000.00	840,000	42	840,000		0		0
fumehoods - 5', glass student		164	no	18,000.00	2,952,000	70	1,260,000	94	1,692,000		0
other lab equipment		300,000	ls	1.00	300,000	50,000	50,000	250,000	250,000		0
Subtotal Equipment - Specialty					5,702,000	0	3,368,000	0	2,334,000	0	0
Total B32 Equipment		237,603	sf	24.00	5,702,000	32.49	3,368,000	27.52	2,334,000	0.00	0
B33 Conveying Systems											
Elevators											
new elevator	*	3	stp	40,000.00	120,000	3	120,000		0		0
Subtotal Elevators		3	stp	40,000.00	120,000	3	120,000	0	0	0	0
Total B33 Conveying Systems		237,603	sf	0.51	120,000	1.16	120,000	0.00	0	0.00	0
TOTAL B3 FITTINGS & EQUIPMENT					7,582,736		3,813,512		3,769,224		0

ELEMENTAL ESTIMATE

Description	Trade	Quantity		Rate	$	Reno Quantity	Reno $	New Quantity	New $	Temporary (18 mos) Quantity	Temporary (18 mos) $
D1 SITE WORK											
D11 Site Development											
Site Preparation											
site development - allow	+	400,000	ls	1.00	400,000		0	400,000	400,000		0
site ramps, stairs, retaining walls, fill, etc		350,000	ls	1.00	350,000		0	350,000	350,000		0
Subtotal Site Preparation		400,000	ls	1.88	750,000	0	0	400,000	750,000	0	0
Total D11 Site Development		237,603	sf	3.16	750,000	0.00	0	8.84	750,000	0.00	0
TOTAL D1 SITE WORK					750,000		0		750,000		0

ELEMENTAL ESTIMATE

Description	Trade	Quantity		Rate	$	Reno Quantity	Reno $	New Quantity	New $	Temporary (18 mos) Quantity	Temporary (18 mos) $
D2 ANCILLARY WORK											
D21 Demolition											
Demolition											
demolition		29,256	sf	7.50	219,420	29,256	219,420		0		0
minor demolition for HVAC upgrades		74,406	sf	2.00	148,812	74,406	148,812		0		0
remove existing roof		51,831	sf	2.00	103,662	51,831	103,662		0		0
Subtotal Demolition					471,894	0	471,894	0	0	0	0
Total D21 Demolition		237,603	sf	1.99	471,894	4.55	471,894	0.00	0	0.00	0
D22 Alterations											
Work to Adjacent											
rental unit and ramp (6 units x 18 months)		108	mt	10,075.00	1,088,100		0		0	108	1,088,100
delivery, levelling, setup		1	no	31,000.00	31,000		0		0	1	31,000
removal, return		1	no	27,000.00	27,000		0		0	1	27,000
fitout space for lab space		40,950	sf	40.00	1,638,000		0		0	40,950	1,638,000
add fumehoods (complete system)		164	no	25,000.00	4,100,000		0		0	164	4,100,000
Subtotal Work to Adjacent					6,884,100	0	0	0	0	0	6,884,100
Total D22 Alterations		237,603	sf	28.97	6,884,100	0.00	0	0.00	0	140.09	6,884,100
TOTAL D2 ANCILLARY WORK					7,355,994		471,894		0		6,884,100

ELEMENTAL ESTIMATE					Reno		New		Temporary (18 mos)	
Description	Trade	Quantity	Rate	$	Quantity	$	Quantity	$	Quantity	$
DIRECT CONSTRUCTION COST				28,072,360		7,156,289		14,031,971		6,884,100

Z1 GENERAL REQUIREMENTS

Z11 General Requirements

General Requirements

Z111 Supervision & Labour Expenses
Supervision & Site Staff: Supervision, site staff, superintendent, engineers, watchman and security, attendance on architect or clerk of works, attendance on subcontractors, scheduling, coordination.
Phasing Premium.
Labour Expenses: premium time, overtime, miscellaneous travel and lodging, wage increases; Remote site transportation and accommodations.

Z112 Temporary Facilities
Access: Temporary roads, staging, storage and parking areas, signage and traffic control.

Accommodation: Temporary offices and sheds, temporary toilets, telephone, office and first aid supplies, camp facilities, mobilization and maintenance.

Expenses, Reimbursables: Layout and preparation, documents and photographs, mockups and samples, printing and duplication.

Protection: Temporary fences, hoardings and barricades; Scaffolding, ramps and runways, guard rails, stairs and ladders, temporary partitions and dust screens, wind bracing, temporary fire protection, site protection including sidewalks, curbs, trees, etc.

Temporary Services: Water, power, heat, site drainage.

Equipment: mobile and tower cranes, hoists and temporary elevators, forklifts, trucking, buggies, disposal chutes, other equipment rental and associated costs such as fuel, oil and consumables.

Winter Conditions: Winter concrete premium, snow and ice clearing, tarpaulins, insulation mats, enclosures, etc.

Clean-up: Daily and final cleanup, glass cleaning, dumpster rental and dumping charges.

Z113 Permits, Insurance, Bonds & Other Expenses
Fire, liability and theft insurance, all risk insurance, performance and bid bonds, building permit, miscellaneous permits, taxes and fees, testing and inspection.

Description	Trade	Quantity	Rate	$	Reno Quantity	Reno $	New Quantity	New $	Temporary Quantity	Temporary $
General Requirements	+	.0% ls		0	.0%	0	.0%	0	.0%	0
Subtotal General Requirements		ls		0	0	0	0	0	0	0
Total Z11 General Requirements		237,603 sf		0	0.00	0	0.00	0	0.00	0

Z12 Fee

ELEMENTAL ESTIMATE

Description	Trade	Quantity	Rate	$	Reno Quantity	Reno $	New Quantity	New $	Temporary (18 mos) Quantity	Temporary (18 mos) $
Profit/Fee/Risk										
Z121 Profit/Fee: Head office overhead, construction manager's fee, general contractors profit. Z122 Risk: Warranties, guarantees and liquidated damages. Labour restrictions & requirements; Strike or lockout delays. Bidding restrictions and requirements.										
Profit/Fee/Risk	+	.0% ls		0	.0%	0	.0%	0	.0%	0
Subtotal Profit/Fee/Risk		ls		0	0	0	0	0	0	0
Total Z12 Fee		237,603 sf		0	0.00	0	0.00	0	0.00	0
TOTAL Z1 GENERAL REQUIREMENTS				0		0		0		0

ELEMENTAL ESTIMATE

Description	Trade	Quantity	Rate	$	Reno Quantity	Reno $	New Quantity	New $	Temporary (18 mos) Quantity	Temporary (18 mos) $
Z2 CONTINGENCIES										
Z21 Design Contingency										

Design Stage Contingency

Design contingency covers unanticipated changes during design and is absorbed as design progresses and more detailed information becomes available and is normally reduced to zero for final documents.

Z211 Documentation
Covers errors and omissions in design documents, definition of lump sum allocations (unmeasured items), development and definition of measured elements, development and definition of details and assemblies.

Z212 Estimating
Covers estimating errors and omissions.

Z213 Program
Covers unforeseen site conditions, program and user scope changes, owner directed design changes, design changes caused by regulatory bodies (excluded - typically with project contingency).

Description	Trade	Quantity	Rate	$	Reno Quantity	Reno $	New Quantity	New $	Temporary (18 mos) Quantity	Temporary (18 mos) $
Design Stage Contingency	+	15.0% ls		4,210,854	15.0%	1,073,443	15.0%	2,104,796	15.0%	1,032,615
Subtotal Design Stage Contingency		0 ls		4,210,854	0	1,073,443	0	2,104,796	0	1,032,615
Total Z21 Design Contingency		237,603 sf		4,210,854	10.36	1,073,443	24.82	2,104,796	21.01	1,032,615
Z22 Escalation Contingency										

Escalation Contingency

Escalation contingency covers rate increases from the present to the start of construction and is normally reduced to zero for final documents.

Z221 Inflation:
Covers increases due to inflation (labour and materials) until start of construction.

Z222 Bidding:
Covers increases due to lack of bidders or busy market conditions, variance between actual bid amounts and averages used in estimating.

During periods of unstable market conditions and price volatility, we recommend a bidding contingency (usually 5 - 10 percent) be included to reflect both the sudden upward or downward shifts in the market and the greater spread to be expected in the range of bids.

Description	Trade	Quantity	Rate	$	Reno Quantity	Reno $	New Quantity	New $	Temporary (18 mos) Quantity	Temporary (18 mos) $
Escalation Contingency	+	.0% ls		0	.0%	0	.0%	0	.0%	0

ELEMENTAL ESTIMATE					Reno		New		Temporary (18 mos)	
Description	Trade	Quantity	Rate	$	Quantity	$	Quantity	$	Quantity	$
Subtotal Escalation Contingency		ls		0	0	0	0	0	0	0
Total Z22 Escalation Contingency		237,603 sf		0	0.00	0	0.00	0	0.00	0
Z23 Construction Contingency										

Construction Contingency
Construction contingency covers changes during construction.

Z231 Documentation
Covers extra costs during construction due to unforeseen site conditions, errors and omissions in documentation or construction management, etc. (typically included).

Z232 Program
Covers extra costs during construction due to program and user scope modifications, changes caused by regulatory bodies, overrun of cash allowances, etc (excluded - typically with project contingency).

Description	Trade	Quantity	Rate	$	Reno Quantity	Reno $	New Quantity	New $	Temporary Quantity	Temporary $
Construction Contingency	+	3.5% ls		985,297	5.0%	357,814	3.0%	420,959	3.0%	206,523
Subtotal Construction Contingency		0 ls		985,297	0	357,814	0	420,959	0	206,523
Total Z23 Construction Contingency		237,603 sf		985,297	3.45	357,814	4.96	420,959	4.20	206,523
TOTAL Z2 CONTINGENCIES				5,196,151		1,431,258		2,525,755		1,239,138

ELEMENTAL ESTIMATE					Reno		New		Temporary (18 mos)	
Description	Trade	Quantity	Rate	$	Quantity	$	Quantity	$	Quantity	$
INDIRECT CONSTRUCTION COST				5,196,151		1,431,258		2,525,755		1,239,138
TOTAL COSTS				$33,268,510		$8,587,547		$16,557,725		$8,123,238

COST OPINION LEVEL	
X	NO DESIGN DONE (Class V)
	SCHEMATIC DESIGN (Class IV)
	DESIGN DEVELOPMENT (Class III)
	FINAL DOCUMENTS (Class II)
	OTHER

Opinion of Probable Construction Cost

Client: **University of NC - Charlotte**
Project: **Burson Chemistry Building Renovation & Expansion**

Location: Charlotte, NC
Date: 30-Aug-2013
Revision: rev 1 **FINAL MEP**
Project Manager: Rob Stout, PE
Stantec Project No. 178410005

See MEP Tabs----------

		OPTION 1 - RENOVATE EXISTING		(Add to Option 1) EXPAND BUILDING		OPTION 2 - EXPANDED + RENOVATED BUILDING	
		103,662 square feet		59,801 square feet		163,463 square feet	
CONSTRUCTION-RELATED COSTS		Renovation		New Construction		TOTAL	
			$/SF		$/SF	-	$/SF
Temporary Classroom Facilities						-	
Mobile Units Rental		1,088,100				1,088,100	6.66
Set-up and break-down		58,000				58,000	0.35
Fit-out as Teaching labs		1,638,000				1,638,000	10.02
Add fume hoods and support systems		4,100,000		(2,000,000)	($33.44)	2,100,000	12.85
Burson Building							
Sitework		-		750,000	$12.54	750,000	4.59
Substructure		-		683,885	$11.44	683,885	4.18
Structure		401,817	$3.88	2,499,861	$41.80	2,901,678	17.75
Elevator to Penthouse		277,000	$2.67			277,000	1.69
Building Enclosure (includes re-roofing)		1,210,620	$11.68	2,922,759	$48.87	4,133,379	25.29
Partitions & Doors		193,750	$1.87	1,385,250	$23.16	1,579,000	9.66
Finishes		1,104,696	$10.66	2,030,993	$33.96	3,135,689	19.18
Fittings & Equipment (hoods)		3,813,512	$36.79	3,769,224	$63.03	7,582,736	46.39
Ancillary Work (demo)		471,894	$4.55				
Misc. Repairs (REQUIRED)		200,000	$1.93			200,000	1.22
Plumbing		417,750	$4.03	522,522	$8.74	940,272	5.75
Fire Protection		376,087	$3.63	147,748	$2.47	523,835	3.20
HVAC		8,103,000	$78.17	1,618,176	$27.06	9,721,176	59.47
Electrical		2,798,500	$27.00	514,800	$8.61	3,313,300	20.27
GC's Direct Costs:		26,252,726		16,845,218	$281.69	43,097,944	263.66
General Conditions (General Contractor)	10.0%	2,625,273	$25.33	1,684,522	$28.17	4,309,794	26.37
GC Fee & Profit	3.0%	787,582		505,357	$8.45	1,292,938	7.91
GC's Cost (today) + profit		28,877,999	$278.58	18,529,739	$309.86	47,407,738	290.02
Scope Contingency - Level 0	15.0%	4,331,700	$41.79	2,779,461	$46.48	7,111,161	43.50
Subtotal:		33,209,699		21,309,200	$356.34	54,518,899	333.52
Performance/Payment Bonds	1.5%	498,145	$4.81	319,638	$5.35	817,783	5.00
Escalation to constr mid-point: 36 mo.@	0.3%	3,586,647	$34.60	2,301,394	$38.48	5,888,041	36.02
Bid Price @ Projected Bid Date		37,294,492	$359.77	23,930,232	$400.16	61,224,724	374.55
Construction Contingency @	4.0%	1,491,780		957,209		2,448,989	
						-	-
Owner Administrative Costs		150,000				150,000	0.92
Construction Permits						-	-
Community Impact/User Fees						-	-
Off-site Utilities Upgrades						-	-
Testing during Construction		10,000		15,000	$0.25	25,000	0.15
Owner-Furnished Equipment						-	-
Furnishings (graphics, furn.,appliances)				1,000,000	$16.72	1,000,000	6.12
Construction-Related Costs Total:		38,946,271	$375.70	25,902,441	$433.14	64,848,713	396.72
OTHER PROJECT COSTS:							
Land Acquisition, Financing Costs & "Due Diligence"							
Moving Costs (Out/in 1st & 2nd floors)		200,000				200,000	
Temporary (float) Space (see above)						-	
Land Acquisition						-	
Rights-of-Way						-	
Title Report						-	
Real Estate Appraisal						-	
Bonds & Assessments						-	
Community Development Fees						-	
Legal & Accounting Fees						-	
Topographic/Aerial/Boundary Surveys		10,000				10,000	
Geophysical Investigation/Reports		10,000				10,000	
Environmental Impact Reports						-	
Feasibility Studies		200,000				200,000	
Phase I Environmental Report						-	
Traffic Studies						-	
Interest During Construction 10 mo @	0.25%	466,181		299,128		765,309	
Subtotal:		886,181		299,128		1,185,309	7.25
Design Costs							
Programming / Planning	1.00%	408,811		262,316		671,128	
Architectural & Engineering Fees	9.00%	3,490,764		2,239,870		5,730,634	
Landscape Architecture Fees	0.25%	93,236		59,826		153,062	
Interior Design & Graphics	0.25%	93,236		59,826		153,062	
Subtotal:		4,086,048		2,621,837		6,707,885	41.04
			$/SF		$/SF	-	$/SF
TOTAL PROJECT BUDGET		$ 43,918,501	$423.67	$ 28,823,406	$481.99	72,741,907	445.01

NOTES & QUALIFICATIONS:

1 Level 0 Cost Estimate means that no design has been done. 90% confidence range is +/- 25% of estimate.

2 Scope Contingency accounts for items that creep into the project scope between conception and completion of construction documents. Scope Contingency becomes zero at completion of Bid Documents

3 Construction Contingency is for additional work uncovered after construction begins. It does not include any allowance for "scope creep".

4 Cost Opinion does NOT include:

5

Appendix C
Arch./Struct. Facility Assessment

2.0 Engineered Systems Review and Recommendations

2.5 BUILDING ENVELOPE

During Stantec's site visit on June 18, 2013, Stantec conducted a general review of the exterior building envelope, in addition to isolated interior rooms as guided by the building's on-site Maintenance Staff. Not every room within the Burson Building was accessed; only those rooms with previously observed deficiencies as indicated by the building's on-site Maintenance Staff. Building envelope observations are documented in attached photographs No. 1 through No. 216, at locations noted on attached Plans S1 through S3. Specific observations are listed as follows:

2.5.1 Exterior Elevations

Exterior elevations of the Burson Building are shown in attached photographs No. 1 through No. 28.

2.5.2 Cracked and/or Displaced Brick Veneer

Isolated individual brick masonry units in exterior brick veneer are cracked and/or displaced as shown in example photographs No. 29 through No. 32, No. 34, No. 35, No. 62, No. 63, No. 67, No. 68, No. 88, No. 89, and No. 91. Displaced brick masonry units should be removed, salvaged, cleaned, and reinstalled in new Type "S" Mortar. Similarly, cracked brick masonry units should be removed and replaced with new masonry units laid in new Type "S" Mortar, as required to match original masonry units as close as practical. New masonry units should be stained where required to match original masonry units in color. New and salvaged masonry units should be laid with new control joints, as required to protect against future cracks, protect against future displacements, and prevent water infiltration. At exterior steel girders, headers, and/or shelf angles supporting brick veneer, exterior steel members should be thoroughly cleaned, coated, and isolated as required to protect against future deterioration.

2.5.3 Deteriorated Exterior Joint Sealants

Joint sealants within exterior control joints have reached their service life and are severely deteriorated as shown in example photographs No. 33, No. 37, No. 38, No. 67, No. 68, No. 79, No. 80, No. 82, No. 83, No. 93, No. 96, and No. 97. All joint sealants in exterior control joints should be removed and replaced with new backer rods and joint sealants, as required for the prevention of water infiltration.

2.5.4 Active Mortar Joints

Several mortar joints between precast members and brick veneer are cracked and/or displaced, as shown in example photographs No. 36, No. 38, No. 94, No. 95, and No. 98. All mortar within active mortar joints should be removed and replaced with new backer rods and joint sealants, as required for the prevention of falling debris and water infiltration.

2.5.5 Inadequate Guardrails

Several exterior guardrails are less than the minimum required height and contain excessive picket spacings, as shown in example photographs No. 40, No. 45, No. 58, No. 64, No. 65, No. 66, No. 70, and No. 77. All guardrails should be upgraded for conformance with the 2012 NC State Building Code, including code compliant handrails.

2.5.6 Deteriorated Exterior Stairs

Exterior stairways are significantly deteriorated, as shown in example photographs No. 41 through No. 43, No. 59 through No. 61, and No. 71 through No. 76. All exterior stairs and stair landings should be rehabilitated, as required to meet current load requirements of the 2012 NC State Building Code and protect against future deterioration.

2.5.7 Stained Exterior Brick Veneer

Isolated areas of exterior brick veneer are stained with efflorescence, mildew, and/or vegetation as shown in example photographs No. 46, No. 47, and No. 51 through No. 56. All exterior brick veneer should be thoroughly cleaned of all efflorescence, mildew, vegetation, and other foreign debris. Cap flashing on top of brick masonry walls should be removed and replaced with new waterproofing membranes and cap flashing, as required for the prevention of water infiltration.

2.5.8 Cracked Exterior Slabs-on-Grade

Some exterior slabs-on-grade in the vicinity of the loading dock are significantly cracked, as shown in attached photographs No. 48 through No. 50. Any severely cracked or dysfunctional exterior slabs should be removed and replaced with new slabs-on-grade, adequately designed for resistance to heavy truck loads.

2.5.9 Displaced Window Framing

Isolated windows have deteriorated and/or displaced framing as shown in example photographs No. 84 through No. 87, No. 90, and No. 92. All exterior windows should be rehabilitated under the direction of the Manufacturer’s Representative, as required to replace any deteriorated or missing framing and prevent water infiltration.

2.5.10 Spalled Exterior Concrete

Isolated exterior concrete members are cracked and/or spalled as shown in attached photographs No. 94 and No. 98. All exterior cracked and/or spalled concrete should be repaired with adequately applied patching mortars; following saw cutting, chipping, cleaning, and coating operations in strict accordance with the Manufacturer's Recommendations.

2.5.11 Leaking Southeast Entry Plaza

The Southeast Entry Plaza at the Second Floor contains leaks into the First Floor Main Entrance, as shown in attached photographs No. 99 through No. 102. The Second Floor Main Entry Plaza should be rehabilitated, as required for the prevention of water infiltration.

2.5.12 Leaking East Wall at the Southeast Auditorium

The east wall of the Southeast First Floor Auditorium contains leaks, as shown in attached photographs No. 103 through No. 105. According to the on-site Maintenance Staff, leaks within the Southeast Auditorium originated from a previous car accident along the east wall. Exterior grades along the east wall should be excavated, as required to remove and replace all deficient waterproofing and provide adequate subsurface drainage for the elimination of water infiltration.

2.5.13 Severely Deteriorated Lab Fixtures

Isolated countertops, sinks, and plumbing fixtures have reached their service life and are severely deteriorated, as shown in example photograph No. 106. Any severely deteriorated countertops, sinks, plumbing fixtures, or other appurtenances should be removed and replaced.

2.5.14 Deteriorated Interior Joint Sealants

Joints sealants within interior control joints have reached their service life and are deteriorated as shown in example photographs No. 107, No. 111, No. 112, and No. 119 through No. 122. All joint sealants in interior control joints should be removed and replaced with backer rods and joint sealants, as required to complement interior finishes.

2.5.15 Cracked Interior Floor Finishes

Isolated First Floor finishes over slabs-on-grade are cracked and/or displaced as shown in example photographs No. 108, No. 109, No. 110, No. 116, No. 117, and No. 118. Any cracked floor finishes should be removed and replaced as required to eliminate trip hazards, but only after repair of any slab-on-grade deficiencies. At active cracks in existing slabs-on-grade, control joints shall be provided in new floor finishes.

2.5.16 Cracked Interior Concrete Masonry

Isolated concrete masonry walls within the building are cracked, as shown in example photographs No. 113, No. 114, No. 115, No. 123, No. 124, No. 163, No. 164, and No. 165. Each individual crack should be more thoroughly investigated as to its origin, and repaired as coordinated with the Engineer in the Field.

2.5.17 Leaking Roof

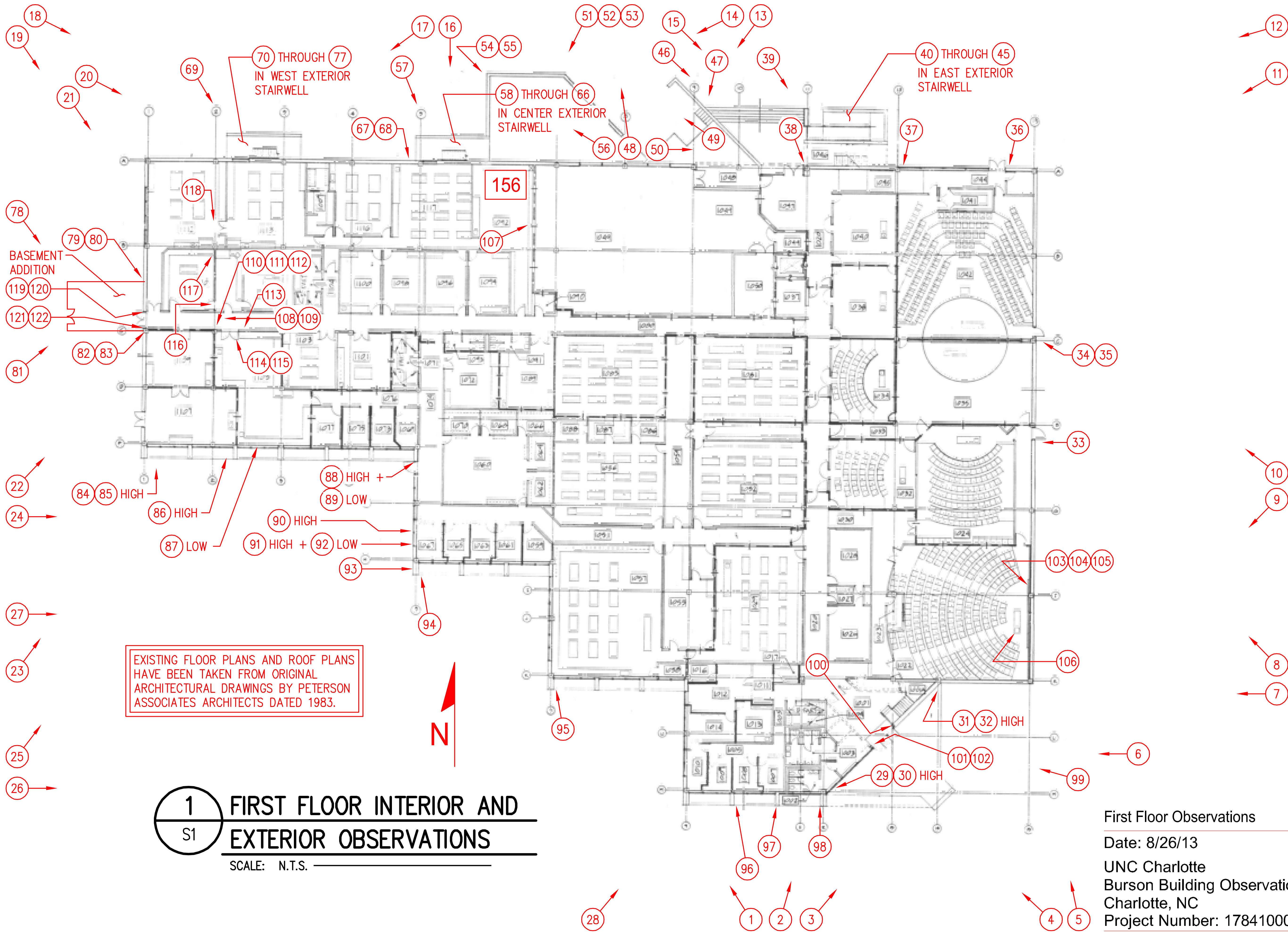
Numerous leaks were observed on Second Floor Ceilings, as shown in example photographs No. 125 through No. 159. Note that water damaged interior ceiling tiles are frequently replaced by the on-site Maintenance Staff and not all interior rooms were reviewed by Stantec. Therefore, the number of photographed leaks does not reflect the actual number of leaks. The existing roof should be removed and replaced, as required to eliminate all leaks.

2.5.18 Chemical Stained Furniture and Floor Finishes

Floors and furniture in chemical storage areas are severely stained, as shown in example photographs No. 160 through No. 162. All chemical storage areas should be thoroughly cleaned by removing obsolete chemicals, removing excess debris, removing inappropriate containers, replacing deteriorated floor finishes, and rehabilitating all furniture.

2.5.19 Roof

As shown in attached photographs No. 166 through No. 194, the existing roof contains miscellaneous equipment, equipment platforms, exterior duct work, parapets, and mechanical unit enclosures which are covered with translucent skylight panels. Water ponds on isolated areas of the roof, as shown in attached photographs No. 195 through No. 200. Sharp foreign debris was observed on the roof, as shown in attached photographs No. 201 through No. 203. Skylight mechanical enclosures leak as a result of deteriorated joint sealants, deteriorated framing, and loose framing as shown in example photographs No. 204 through No. 209, resulting in water damaged interior finishes as shown in example photographs No. 210 through No. 216. In conjunction with mechanical restorations, all existing roofing on the structure must be completely removed and replaced with new roofing and new drainage systems, as required to eliminate ponding water and prevent water infiltration.



1
S1

FIRST FLOOR INTERIOR AND
EXTERIOR OBSERVATIONS

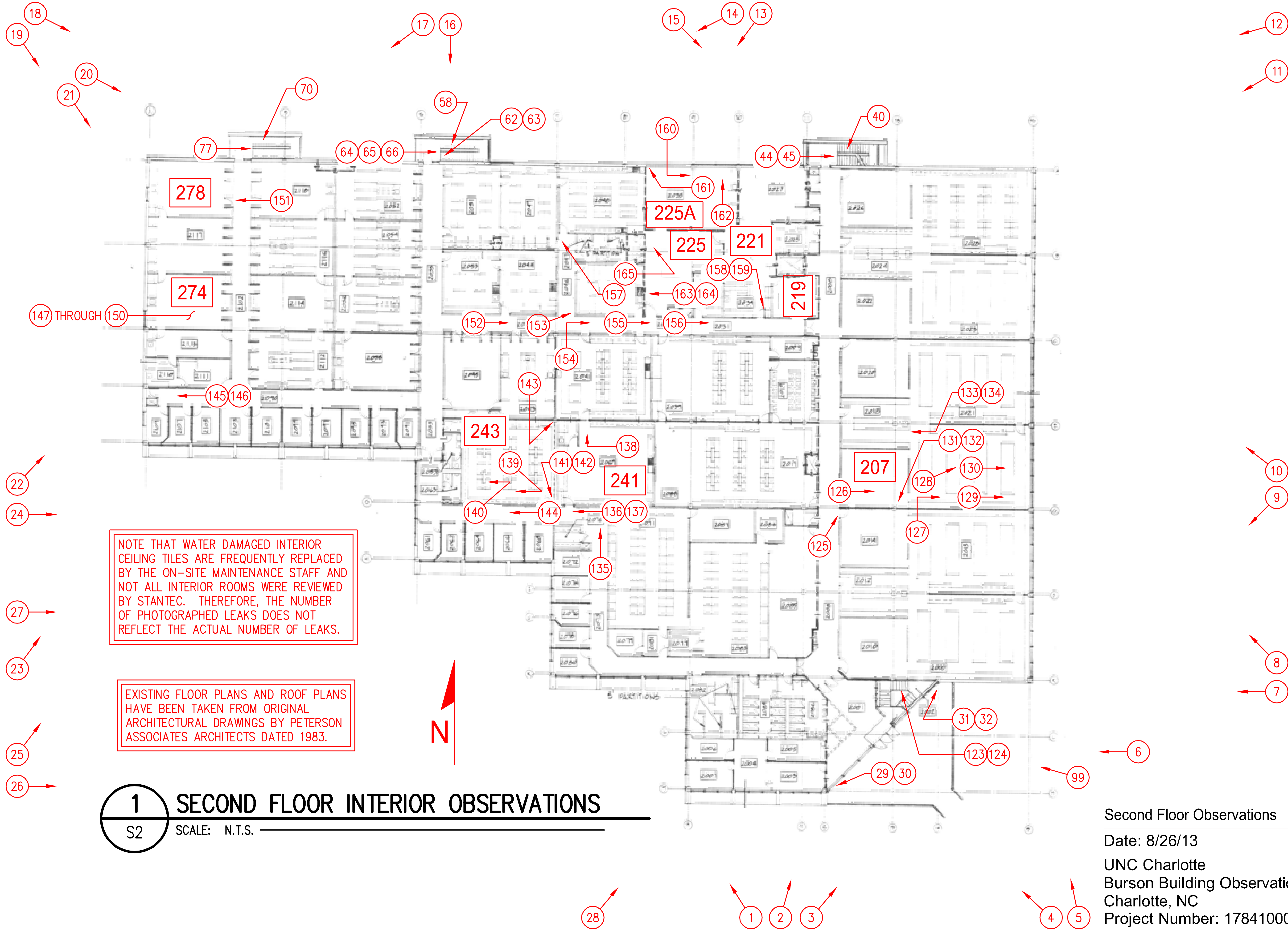
SCALE: N.T.S.

First Floor Observations S1

Date: 8/26/13

UNC Charlotte
Burson Building Observations
Charlotte, NC
Project Number: 178410005

Stantec



NOTE THAT WATER DAMAGED INTERIOR CEILING TILES ARE FREQUENTLY REPLACED BY THE ON-SITE MAINTENANCE STAFF AND NOT ALL INTERIOR ROOMS WERE REVIEWED BY STANTEC. THEREFORE, THE NUMBER OF PHOTOGRAPHED LEAKS DOES NOT REFLECT THE ACTUAL NUMBER OF LEAKS.

EXISTING FLOOR PLANS AND ROOF PLANS HAVE BEEN TAKEN FROM ORIGINAL ARCHITECTURAL DRAWINGS BY PETERSON ASSOCIATES ARCHITECTS DATED 1983.

1 / S2 SECOND FLOOR INTERIOR OBSERVATIONS

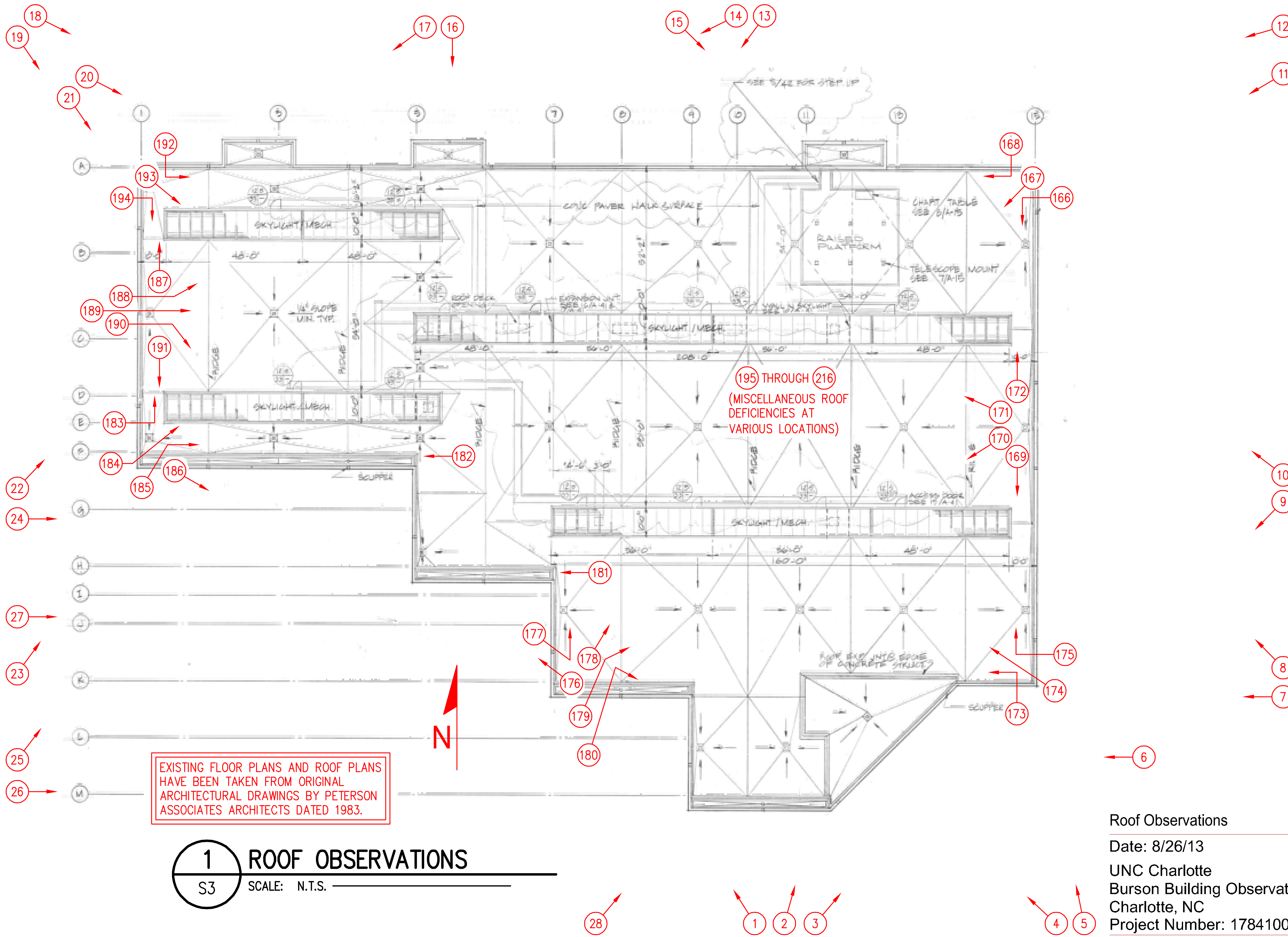
SCALE: N.T.S.

Second Floor Observations S2

Date: 8/26/13

UNC Charlotte
Burson Building Observations
Charlotte, NC
Project Number: 178410005

Stantec



1 S3 ROOF OBSERVATIONS

SCALE: N.T.S.

Roof Observations

S3

Date: 8/26/13

UNC Charlotte
Burson Building Observations
Charlotte, NC
Project Number: 178410005

Stantec

NO. 1 – PARTIAL SOUTH ELEVATION

NO. 2 – PARTIAL SOUTH ELEVATION

NO. 3 – PARTIAL SOUTH ELEVATION

NO. 4 – PARTIAL SOUTHEAST ELEVATION AT MAIN ENTRANCE

NO. 5 – PARTIAL SOUTH ELEVATION AT MAIN ENTRANCE

NO. 6 – PARTIAL EAST ELEVATION AT MAIN ENTRANCE

NO. 7 – PARTIAL EAST ELEVATION

NO. 8 – PARTIAL EAST ELEVATION

NO. 9 – PARTIAL EAST ELEVATION

NO. 10 – PARTIAL EAST ELEVATION

NO. 11 – PARTIAL NORTHEAST ELEVATION

NO. 12 – PARTIAL NORTHEAST ELEVATION

NO. 13 – PARTIAL NORTH ELEVATION

NO. 14 – PARTIAL NORTH ELEVATION

NO. 15 – PARTIAL NORTH ELEVATION

NO. 16 – PARTIAL NORTH ELEVATION

NO. 17 – PARTIAL NORTH ELEVATION

NO. 18 – PARTIAL NORTH ELEVATION

NO. 19 – PARTIAL NORTHWEST ELEVATION

NO. 20 – PARTIAL NORTH ELEVATION

NO. 21 – PARTIAL WEST ELEVATION

NO. 22 – PARTIAL WEST ELEVATION

NO. 23 – PARTIAL SOUTHWEST ELEVATION

NO. 24 – PARTIAL WEST ELEVATION

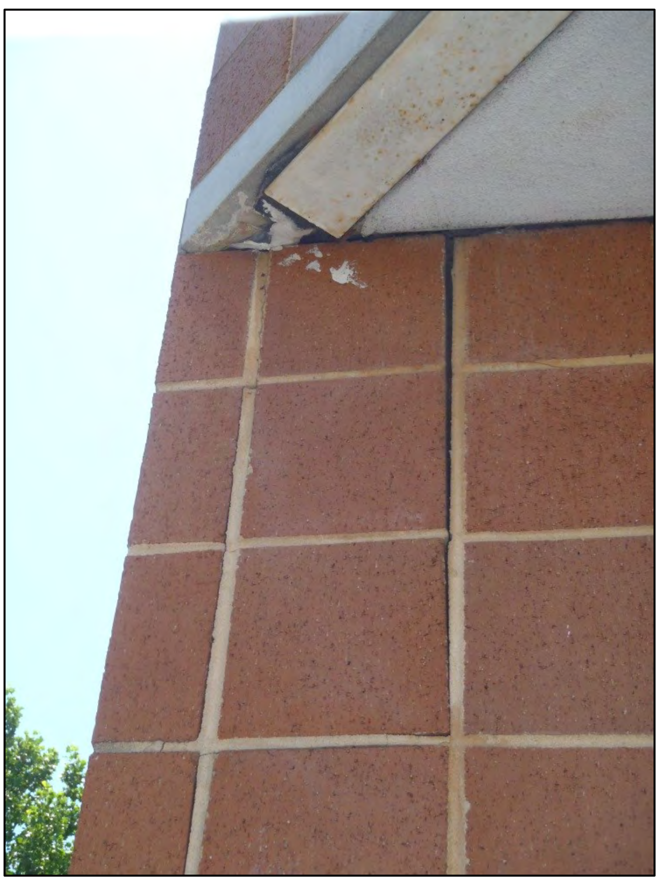
NO. 25 – PARTIAL SOUTHWEST ELEVATION

NO. 26 – PARTIAL WEST ELEVATION

NO. 27 – PARTIAL WEST ELEVATION

NO. 28 – PARTIAL SOUTH ELEVATION

NO. 29 – SOUTHEAST ELEVATION AT MAIN ENTRANCE – DISPLACED BRICK VENEER AT GIRDER BEARING



NO. 30 – SOUTHEAST ELEVATION AT MAIN ENTRANCE – DISPLACED BRICK VENEER AT GIRDER BEARING

NO. 31 – SOUTHEAST ELEVATION AT MAIN ENTRANCE – CRACKED BRICK VENEER AT GIRDER BEARING

NO. 32 – SOUTHEAST ELEVATION AT MAIN ENTRANCE – CRACKED BRICK VENEER AT GIRDER BEARING

NO. 33 – EAST ELEVATION – DETERIORATED JOINT SEALANT

NO. 34 – EAST ELEVATION – CRACKED INDIVIDUAL MASONRY UNIT

NO. 35 – EAST ELEVATION – CRACKED INDIVIDUAL MASONRY UNIT

NO. 36 – NORTH ELEVATION – DETERIORATED EXTERIOR JOINT REQUIRING JOINT SEALANT

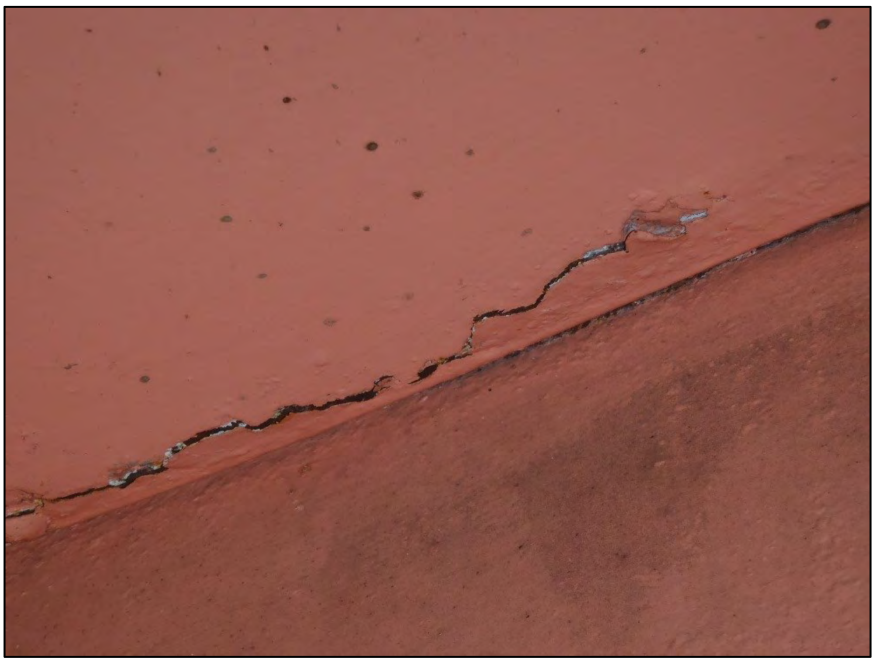
NO. 37 – NORTH ELEVATION – DETERIORATED JOINT SEALANT

NO. 38 – NORTH ELEVATION – DETERIORATED JOINT SEALANT

NO. 39 – NORTH ELEVATION – EAST EXTERIOR STAIRWELL

NO. 40 – NORTH ELEVATION AT EAST EXTERIOR STAIRWELL – INADEQUATE GUARDRAIL HEIGHT AT STAIRS

NO. 41 – NORTH ELEVATION AT EAST EXTERIOR STAIRWELL – DETERIORATED STAIR FRAMING



NO. 42 – NORTH ELEVATION AT EAST EXTERIOR STAIRWELL – DETERIORATED STAIR FRAMING

NO. 43 – NORTH ELEVATION AT EAST EXTERIOR STAIRWELL – DETERIORATED LANDING FRAMING

NO. 44 – NORTH ELEVATION AT EAST EXTERIOR STAIRWELL – INADEQUATE GUARDRAIL PICKET SPACINGS

NO. 45 – NORTH ELEVATION AT EAST EXTERIOR STAIRWELL – INADEQUATE GUARDRAIL PICKET SPACINGS

NO. 46 – NORTH ELEVATION AT EXTERIOR SCREEN WALL

NO. 47 – NORTH ELEVATION AT EXTERIOR SCREEN WALL – EFFLORESCENCE AT EXTERIOR BRICK VENEER

NO. 48 – NORTH ELEVATION AT LOADING DOCK – DETERIORATED EXTERIOR CONCRETE SLAB

NO. 49 – NORTH ELEVATION AT LOADING DOCK – DETERIORATED EXTERIOR CONCRETE SLAB

NO. 50 – NORTH ELEVATION AT LOADING DOCK – DETERIORATED EXTERIOR CONCRETE SLAB

NO. 51 – NORTH ELEVATION AT EXTERIOR SCREEN WALL – EFFLORESCENCE AT EXTERIOR BRICK VENEER

NO. 52 – NORTH ELEVATION AT EXTERIOR SCREEN WALL – EFFLORESCENCE AT EXTERIOR BRICK VENEER

NO. 53 – NORTH ELEVATION AT EXTERIOR SCREEN WALL – EFFLORESCENCE AT EXTERIOR BRICK VENEER

NO. 54 – NORTH ELEVATION AT EXTERIOR SCREEN WALL – EFFLORESCENCE AT EXTERIOR BRICK VENEER

NO. 55 – NORTH ELEVATION AT EXTERIOR SCREEN WALL – EFFLORESCENCE AT EXTERIOR BRICK VENEER

NO. 56 – NORTH ELEVATION AT EXTERIOR SCREEN WALL – EFFLORESCENCE AT EXTERIOR BRICK VENEER

NO. 57 – NORTH ELEVATION – CENTER EXTERIOR STAIRWELL

NO. 58 – NORTH ELEVATION AT CENTER EXTERIOR STAIRWELL – INADEQUATE GUARDRAIL HEIGHT AT STAIRS

NO. 59 – NORTH ELEVATION AT CENTER EXTERIOR STAIRWELL – DETERIORATED LANDING FRAMING

NO. 60 – NORTH ELEVATION AT CENTER EXTERIOR STAIRWELL – DETERIORATED LANDING FRAMING

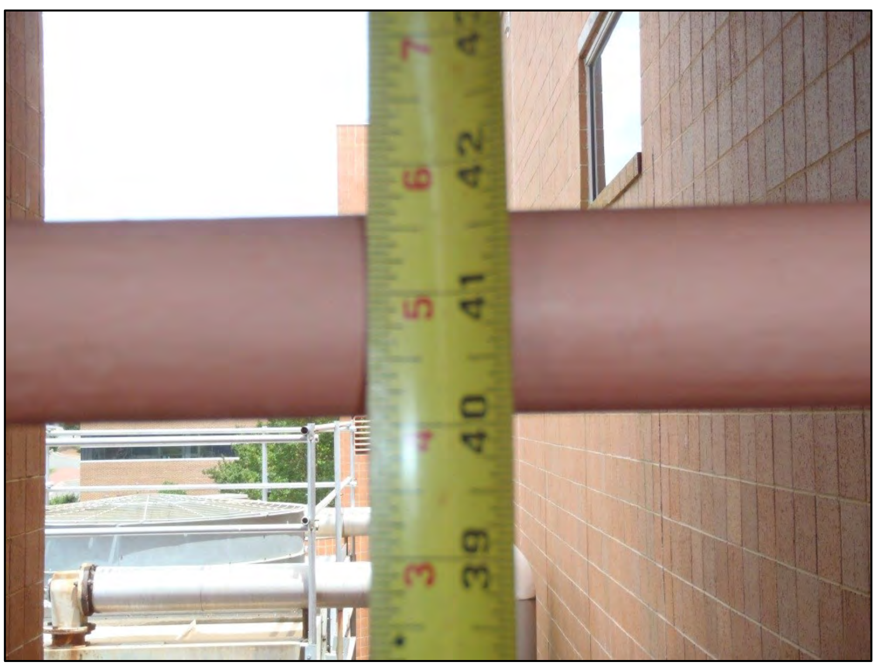
NO. 61 – NORTH ELEVATION AT CENTER EXTERIOR STAIRWELL – DETERIORATED LANDING FRAMING

NO. 62 – NORTH ELEVATION AT CENTER EXTERIOR STAIRWELL – DETERIORATED STEEL GIRDER AND SPALLED BRICK VENEER AT BEAM BEARING LOCATION

NO. 63 – NORTH ELEVATION AT CENTER EXTERIOR STAIRWELL – DETERIORATED STEEL GIRDER AND SPALLED BRICK VENEER AT BEAM BEARING LOCATION

NO. 64 – NORTH ELEVATION AT CENTER EXTERIOR STAIRWELL – INADEQUATE GUARDRAIL PICKET SPACINGS

NO. 65 – NORTH ELEVATION AT CENTER EXTERIOR STAIRWELL – INADEQUATE GUARDRAIL HEIGHT



NO. 66 – NORTH ELEVATION AT CENTER EXTERIOR STAIRWELL – INADEQUATE GUARDRAIL HEIGHT

NO. 67 – NORTH ELEVATION ADJACENT TO THE CENTER EXTERIOR STAIRWELL – DETERIORATED JOINT SEALANT AND CRACKED INDIVIDUAL BRICK MASONRY UNIT

NO. 68 – NORTH ELEVATION ADJACENT TO THE CENTER EXTERIOR STAIRWELL – DETERIORATED JOINT SEALANT

NO. 69 – NORTH ELEVATION – WEST EXTERIOR STAIRWELL

NO. 70 – NORTH ELEVATION AT WEST EXTERIOR STAIRWELL – INADEQUATE GUARDRAIL HEIGHT AT STAIRS

NO. 71 – NORTH ELEVATION AT WEST EXTERIOR STAIRWELL – DETERIORATED STAIR FRAMING

NO. 72 – NORTH ELEVATION AT WEST EXTERIOR STAIRWELL – DETERIORATED STAIR FRAMING

NO. 73 – NORTH ELEVATION AT WEST EXTERIOR STAIRWELL – DETERIORATED STAIR FRAMING

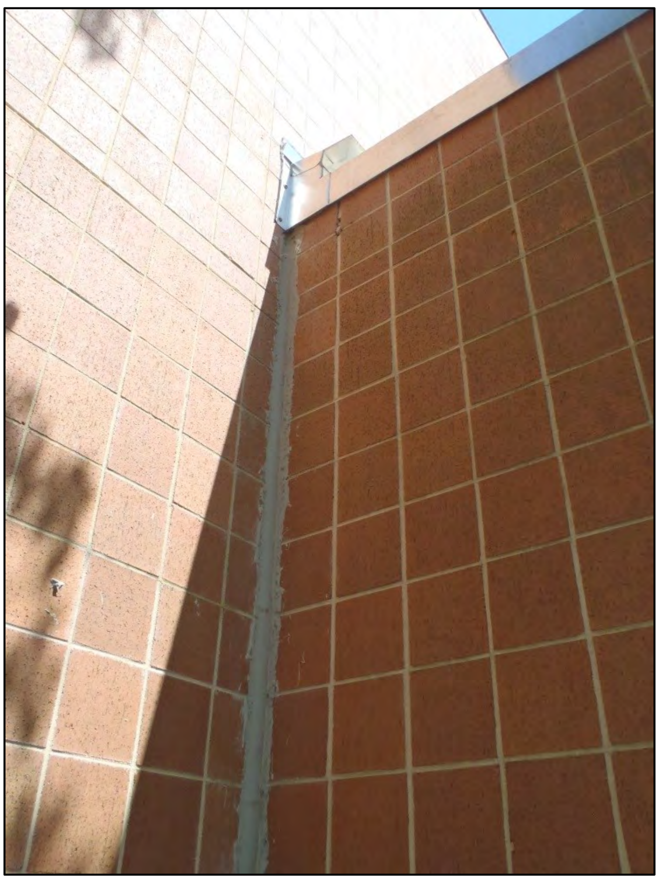
NO. 74 – NORTH ELEVATION AT WEST EXTERIOR STAIRWELL – DETERIORATED STAIR FRAMING

NO. 75 – NORTH ELEVATION AT WEST EXTERIOR STAIRWELL – DETERIORATED STAIR FRAMING

NO. 76 – NORTH ELEVATION AT WEST EXTERIOR STAIRWELL – DETERIORATED LANDING FRAMING

NO. 77 – NORTH ELEVATION AT WEST EXTERIOR STAIRWELL – INADEQUATE GUARDRAIL PICKET SPACINGS

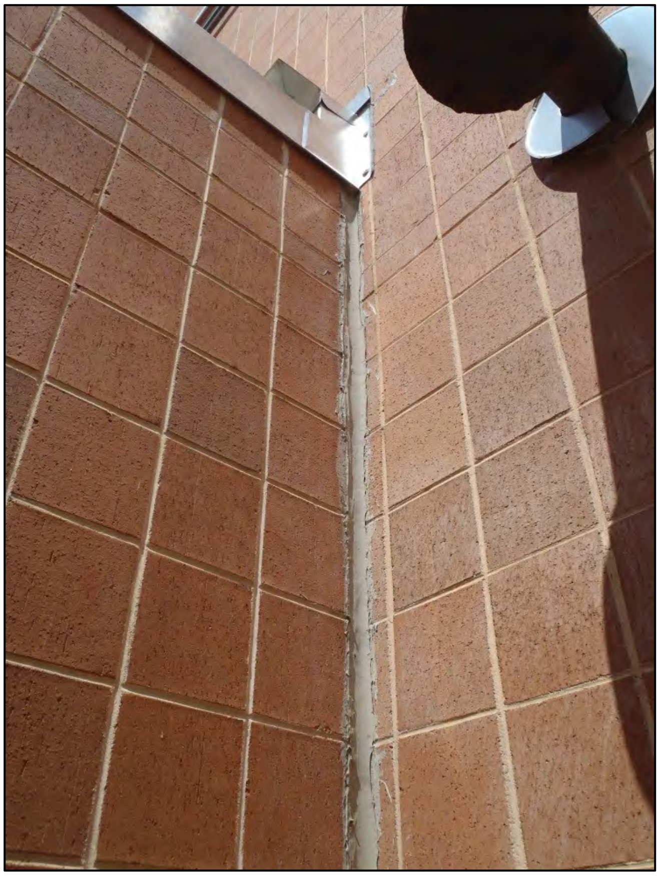
NO. 78 – WEST ELEVATION – BASEMENT ADDITION



NO. 79 – WEST ELEVATION AT BASEMENT ADDITION – DETERIORATED JOINT SEALANT

NO. 80 – WEST ELEVATION AT BASEMENT ADDITION – DETERIORATED JOINT SEALANT

NO. 81 – WEST ELEVATION – BASEMENT ADDITION



NO. 82 – WEST ELEVATION AT BASEMENT ADDITION – DETERIORATED JOINT SEALANT

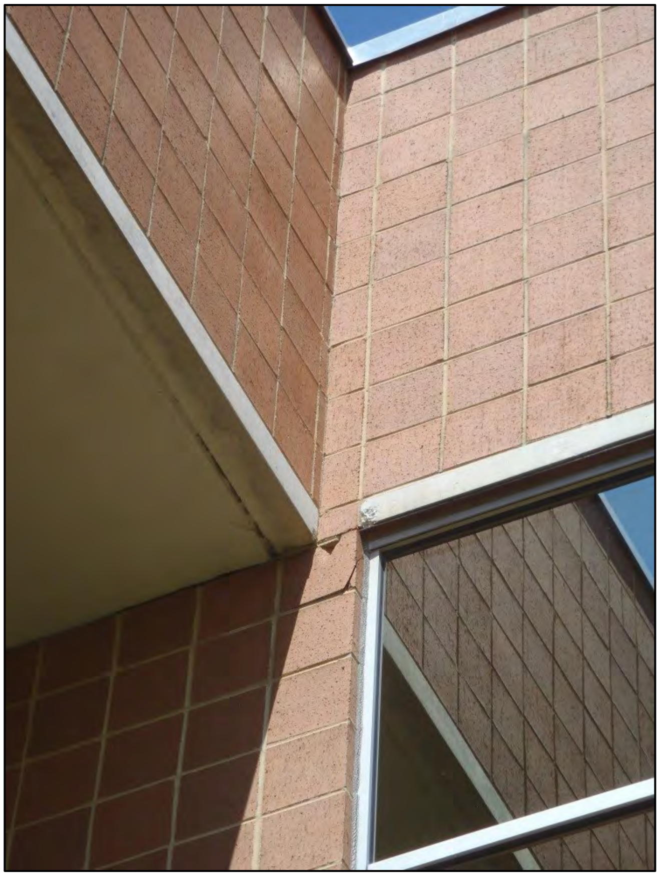
NO. 83 – WEST ELEVATION AT BASEMENT ADDITION – DETERIORATED JOINT SEALANT

NO. 84 – SOUTH ELEVATION – DISPLACED WINDOW FRAMING

NO. 85 – SOUTH ELEVATION – DISPLACED WINDOW FRAMING

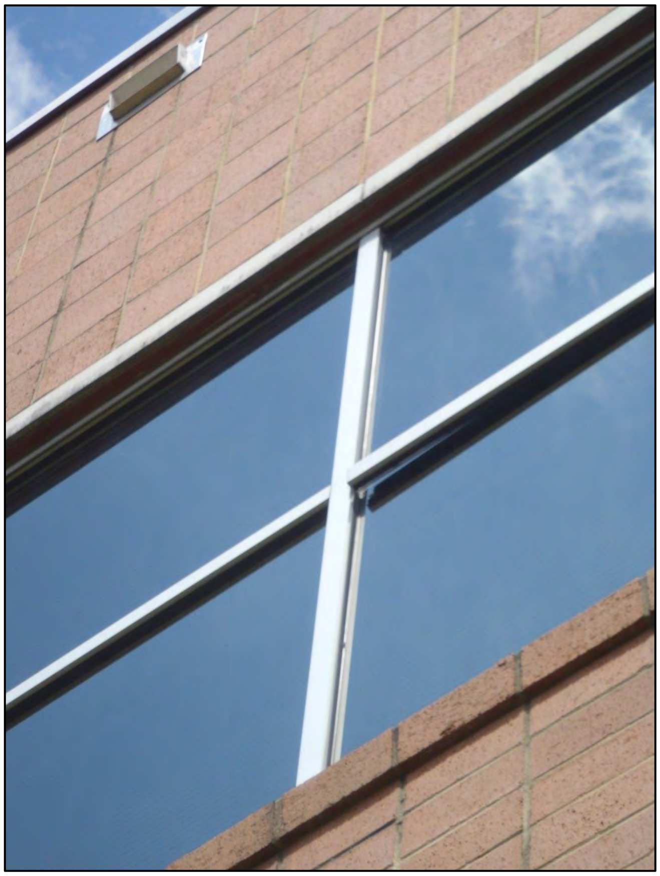
NO. 86 – SOUTH ELEVATION – DISPLACED WINDOW FRAMING

NO. 87 – SOUTH ELEVATION – DISPLACED WINDOW FRAMING



NO. 88 – SOUTHWEST ELEVATION – CRACKED INDIVIDUAL BRICK MASONRY UNITS

NO. 89 – SOUTHWEST ELEVATION – CRACKED INDIVIDUAL BRICK MASONRY UNITS



NO. 90 – SOUTHWEST ELEVATION – DISPLACED WINDOW FRAMING

NO. 91 – SOUTHWEST ELEVATION – CRACKED INDIVIDUAL BRICK MASONRY UNITS

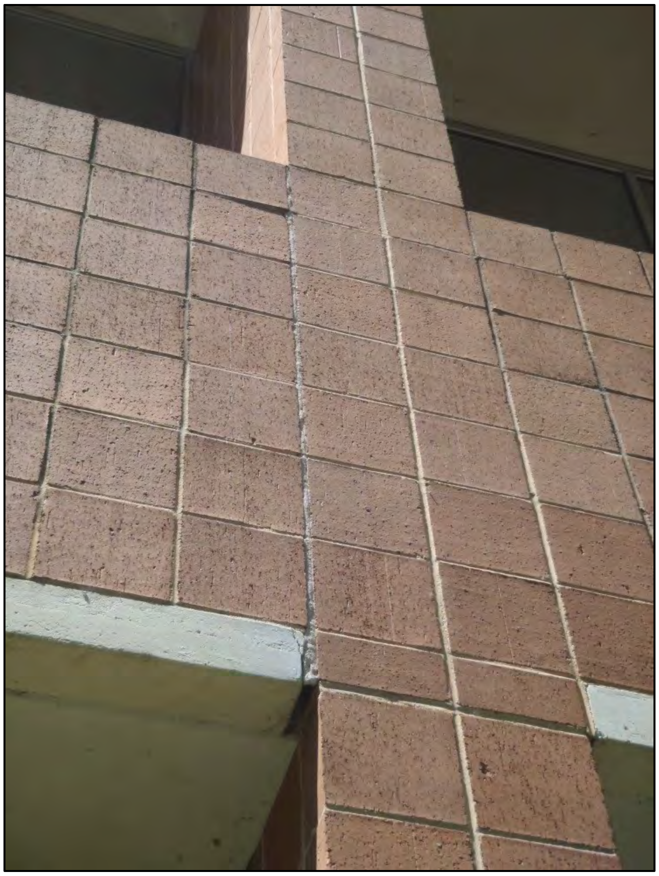
NO. 92 – SOUTHWEST ELEVATION – DISPLACED WINDOW FRAMING

NO. 93 – SOUTHWEST ELEVATION – DETERIORATED JOINT SEALANT

NO. 94 – SOUTH ELEVATION – DETERIORATED JOINT REQUIRING JOINT SEALANT

NO. 95 – SOUTH ELEVATION – DETERIORATED JOINT REQUIRING JOINT SEALANT

NO. 96 – SOUTH ELEVATION – DETERIORATED JOINT SEALANT



NO. 97 – SOUTH ELEVATION – DETERIORATED JOINT SEALANT

NO. 98 – SOUTH ELEVATION – CONCRETE SPALL AND DETERIORATED JOINT REQUIRING JOINT SEALANT

NO. 99 – SECOND FLOOR SOUTHEAST ENTRY PLAZA

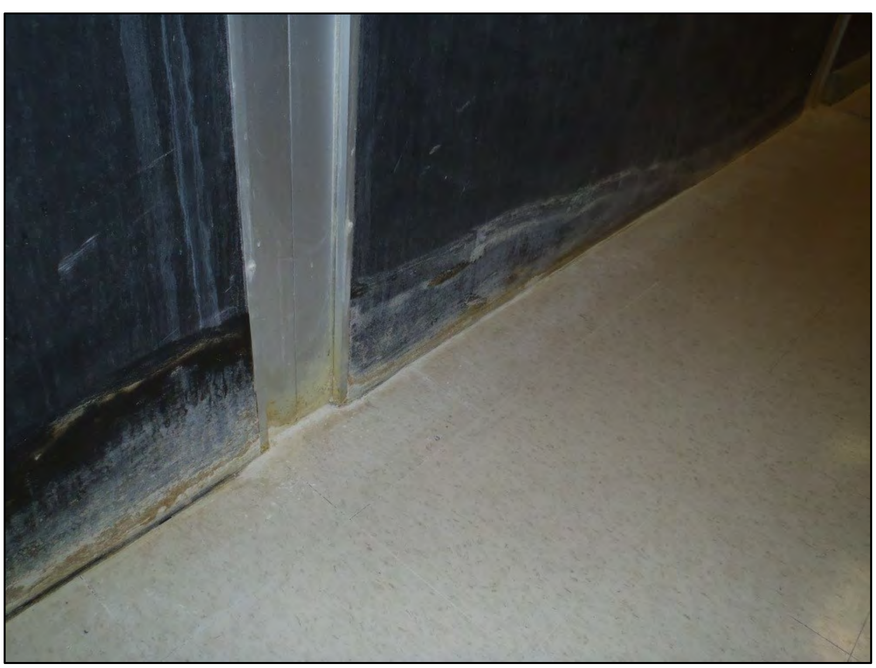
NO. 100 – FIRST FLOOR AT SOUTHEAST ENTRY PLAZA – WATER INFILTRATION

NO. 101 – FIRST FLOOR AT SOUTHEAST ENTRY PLAZA – WATER INFILTRATION

NO. 102 – FIRST FLOOR AT SOUTHEAST ENTRY PLAZA – WATER INFILTRATION

NO. 103 – SOUTHEAST FIRST FLOOR AUDITORIUM – WATER INFILTRATION AT BASE OF WALL

NO. 104 – SOUTHEAST FIRST FLOOR AUDITORIUM – WATER INFILTRATION AT BASE OF WALL



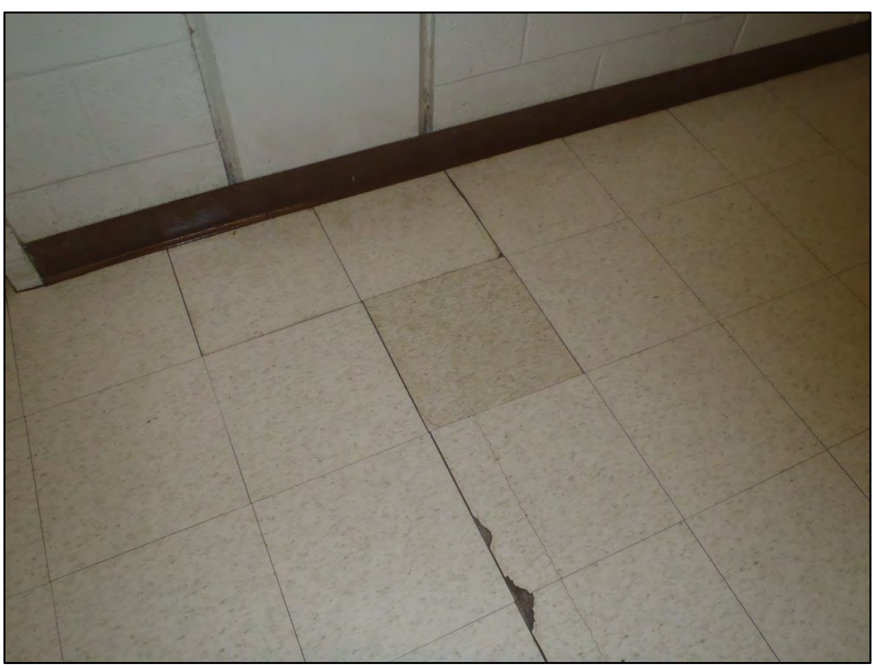
NO. 105 – SOUTHEAST FIRST FLOOR AUDITORIUM – WATER INFILTRATION AT BASE OF WALL

NO. 106 – SOUTHEAST FIRST FLOOR AUDITORIUM – SEVERELY DETERIORATED COUNTERTOP, SINK, AND PLUMBING FIXTURES

NO. 107 – FIRST FLOOR RESEARCH LABORATORY – DETERIORATED INTERIOR JOINT SEALANT

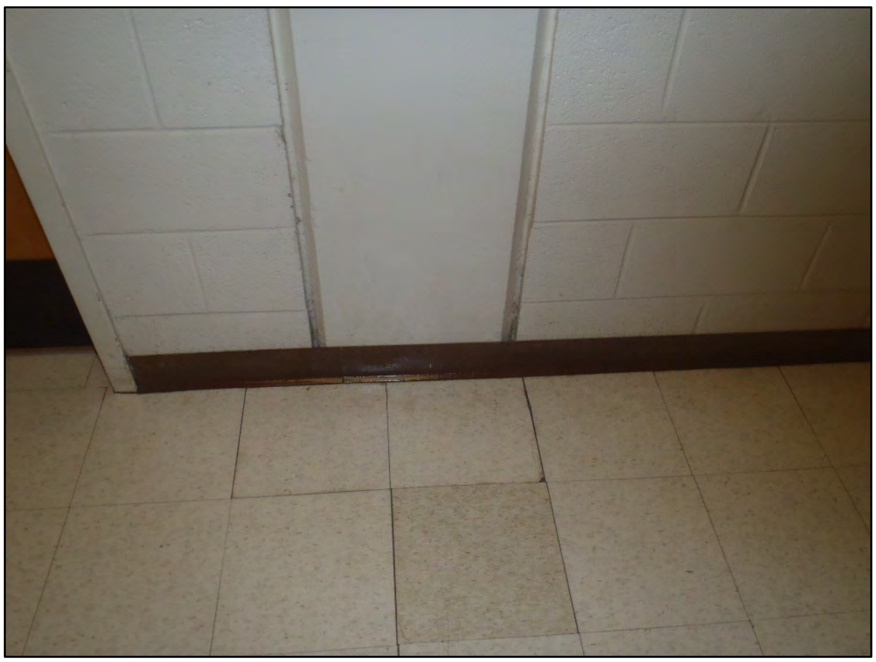
NO. 108 – FIRST FLOOR INTERIOR HALLWAY – CRACKED FLOOR FINISHES

NO. 109 – FIRST FLOOR INTERIOR HALLWAY – CRACKED FLOOR FINISHES



NO. 110 – FIRST FLOOR INTERIOR HALLWAY – CRACKED FLOOR FINISHES

NO. 111 – FIRST FLOOR INTERIOR HALLWAY – DETERIORATED INTERIOR JOINT SEALANTS



NO. 112 – FIRST FLOOR INTERIOR HALLWAY – DETERIORATED INTERIOR JOINT SEALANTS

NO. 113 – FIRST FLOOR INTERIOR HALLWAY – CRACKED INDIVIDUAL CONCRETE MASONRY UNIT

NO. 114 – FIRST FLOOR – INTERIOR CRACKS IN A CONCRETE MASONRY PARTITION WALL

NO. 115 – FIRST FLOOR – INTERIOR CRACKS IN A CONCRETE MASONRY PARTITION WALL

NO. 116 – FIRST FLOOR – CRACKED INTERIOR FLOOR FINISHES

NO. 117 – FIRST FLOOR – CRACKED INTERIOR FLOOR FINISHES

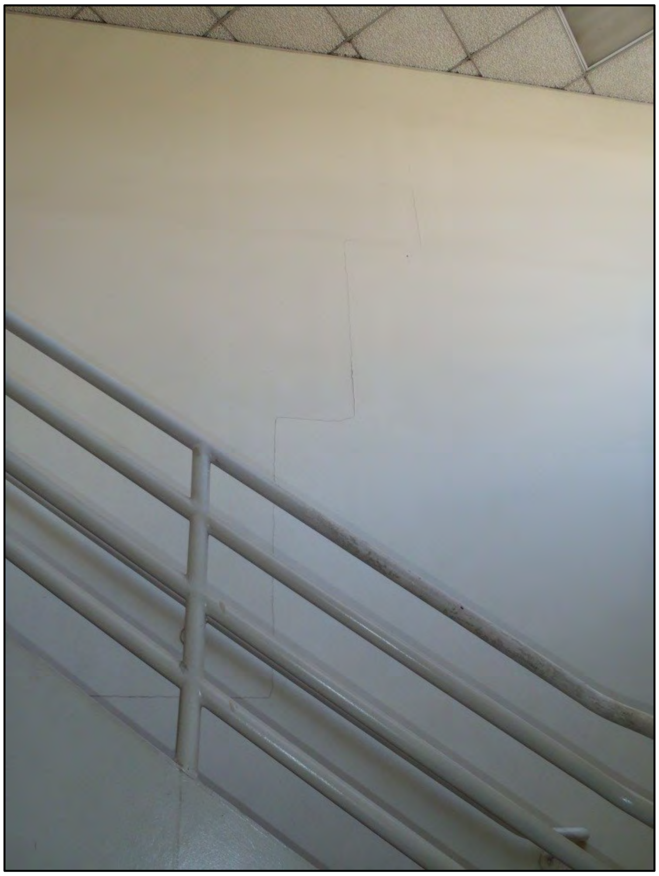
NO. 118 – FIRST FLOOR – DISPLACED INTERIOR FLOOR FINISHES

NO. 119 – FIRST FLOOR BASEMENT ADDITION – INTERIOR JOINT SEALANT

NO. 120 – FIRST FLOOR BASEMENT ADDITION – INTERIOR JOINT SEALANT

NO. 121 – FIRST FLOOR BASEMENT ADDITION – INTERIOR JOINT SEALANT

NO. 122 – FIRST FLOOR BASEMENT ADDITION – INTERIOR JOINT SEALANT

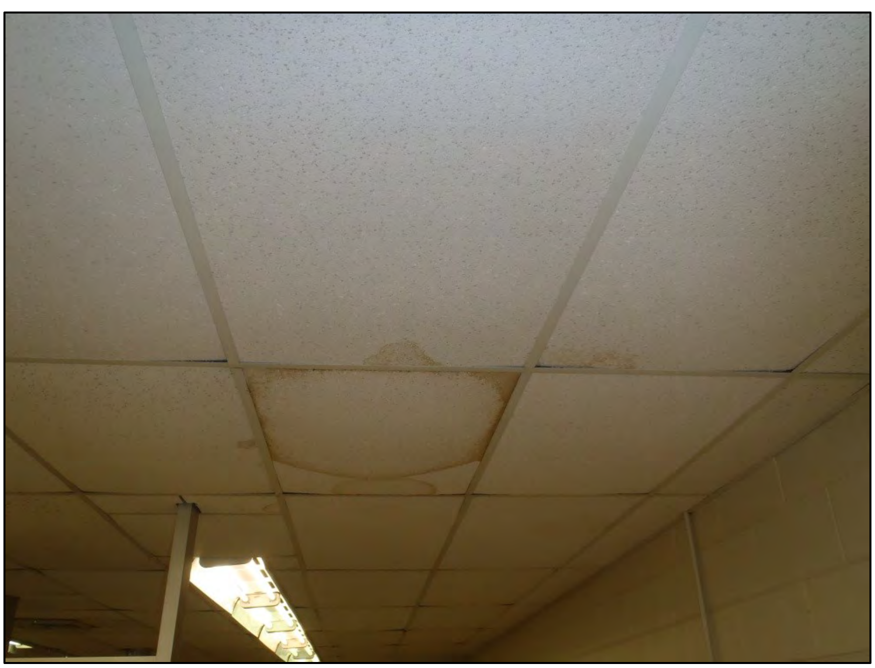


NO. 123 – SECOND FLOOR STAIRWELL AT MAIN ENTRANCE – CRACKED INTERIOR CONCRETE MASONRY

NO. 124 – SECOND FLOOR STAIRWELL AT MAIN ENTRANCE – CRACKED INTERIOR CONCRETE MASONRY

NO. 125 – SECOND FLOOR CORRIDOR – DAMAGED CEILING TILE FROM WATER INFILTRATION

NO. 126 – SECOND FLOOR GENERAL CHEMISTRY LABORATORY 207 – DAMAGED CEILING TILES FROM WATER INFILTRATION

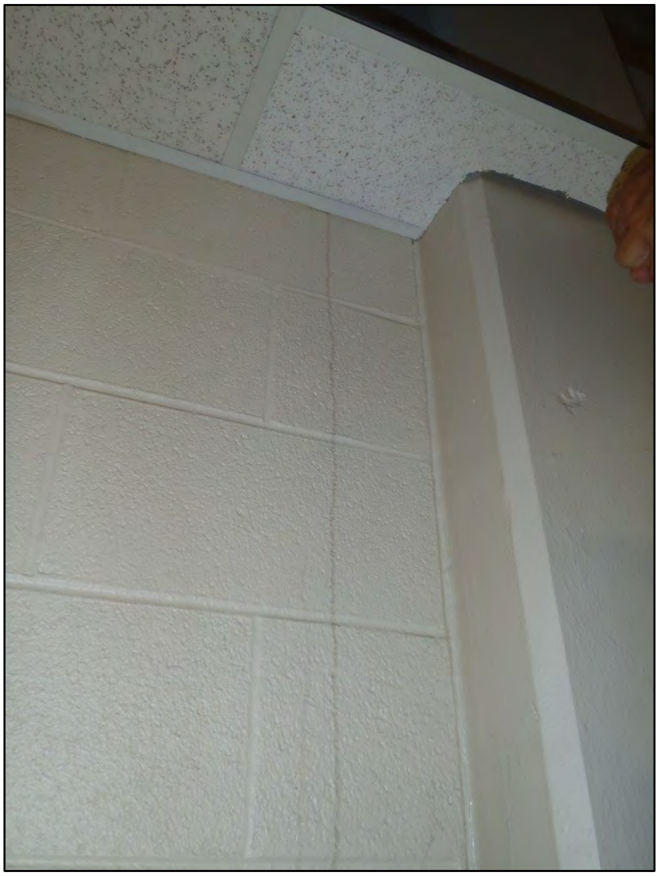


NO. 127 – SECOND FLOOR GENERAL CHEMISTRY LABORATORY 207 – DAMAGED CEILING TILES FROM WATER INFILTRATION

NO. 128 – SECOND FLOOR GENERAL CHEMISTRY LABORATORY 207 – DAMAGED CEILING TILES FROM WATER INFILTRATION

NO. 129 – SECOND FLOOR GENERAL CHEMISTRY LABORATORY 207 – DAMAGED CEILING TILES FROM WATER INFILTRATION

NO. 130 – SECOND FLOOR GENERAL CHEMISTRY LABORATORY 207 – DAMAGED CEILING TILES FROM WATER INFILTRATION



NO. 131 – SECOND FLOOR GENERAL CHEMISTRY LABORATORY 207 – WATER STAINED INTERIOR PARTITION WALL FROM WATER INFILTRATION

NO. 132 – SECOND FLOOR GENERAL CHEMISTRY LABORATORY 207 – WATER STAINED INTERIOR PARTITION WALL FROM WATER INFILTRATION

NO. 133 – SECOND FLOOR GENERAL CHEMISTRY LABORATORY 207 – MISSING CEILING TILES

NO. 134 – SECOND FLOOR GENERAL CHEMISTRY LABORATORY 207 – MISSING CEILING TILES

NO. 135 – SECOND FLOOR CORRIDOR – DAMAGED CEILING TILES FROM WATER INFILTRATION

NO. 136 – SECOND FLOOR CORRIDOR – DAMAGED CEILING TILES FROM WATER INFILTRATION

NO. 137 – SECOND FLOOR CORRIDOR – DAMAGED CEILING TILES FROM WATER INFILTRATION

NO. 138 – SECOND FLOOR ROOM 241 – WATER STAINED DUCT WORK FROM WATER INFILTRATION AND/OR CONDENSATION

NO. 139 – SECOND FLOOR ROOM 243 – STAINED LIGHT FIXTURE DUE TO WATER INFILTRATION

NO. 140 – SECOND FLOOR ROOM 243 – DAMAGED CEILING TILES FROM WATER INFILTRATION

NO. 141 – SECOND FLOOR ROOM 243 – DAMAGED CEILING TILES FROM WATER INFILTRATION

NO. 142 – SECOND FLOOR ROOM 243 – DAMAGED CEILING TILES FROM WATER INFILTRATION

NO. 143 – SECOND FLOOR ROOM 243 – DAMAGED CEILING TILES FROM WATER INFILTRATION

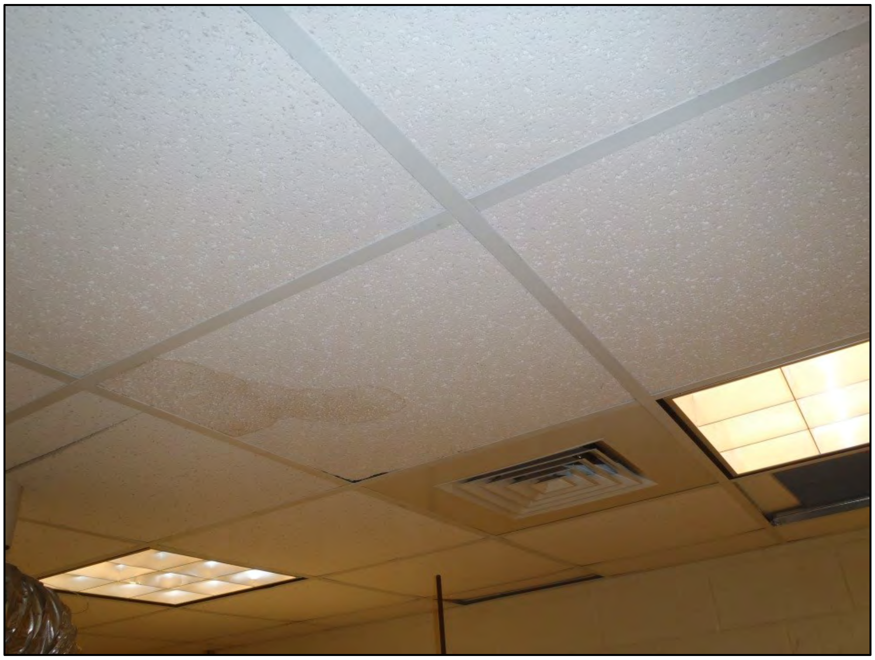
NO. 144 – SECOND FLOOR CORRIDOR – DAMAGED CEILING TILES FROM WATER INFILTRATION

NO. 145 – SECOND FLOOR CORRIDOR – DAMAGED CEILING TILES FROM WATER INFILTRATION

NO. 146 – SECOND FLOOR CORRIDOR – DAMAGED CEILING TILES FROM WATER INFILTRATION

NO. 147 – SECOND FLOOR ROOM 274 RESEARCH LABORATORY – DAMAGED CEILING TILES FROM WATER INFILTRATION

NO. 148 – SECOND FLOOR ROOM 274 RESEARCH LABORATORY – DAMAGED CEILING TILES FROM WATER INFILTRATION



NO. 149 – SECOND FLOOR ROOM 274 RESEARCH LABORATORY – DAMAGED CEILING TILES FROM WATER INFILTRATION

NO. 150 – SECOND FLOOR ROOM 274 RESEARCH LABORATORY – DAMAGED CEILING TILES FROM WATER INFILTRATION

NO. 151 – SECOND FLOOR CORRIDOR – DAMAGED CEILING TILES FROM WATER INFILTRATION

NO. 152 – SECOND FLOOR CORRIDOR – WATER STAINED SKYLIGHT DUE TO WATER INFILTRATION

NO. 153 – SECOND FLOOR CORRIDOR – WATER DAMAGED CEILING TILES FROM WATER INFILTRATION

NO. 154 – SECOND FLOOR CORRIDOR – WATER DAMAGED CEILING TILES FROM WATER INFILTRATION

NO. 155 – SECOND FLOOR CORRIDOR – WATER DAMAGED CEILING TILES FROM WATER INFILTRATION

NO. 156 – SECOND FLOOR CORRIDOR – WATER STAINED SKYLIGHT DUE TO WATER INFILTRATION

NO. 157 – SECOND FLOOR CORRIDOR – WATER DAMAGED CEILING TILES FROM WATER INFILTRATION

NO. 158 – SECOND FLOOR ROOM 221 – WATER STAINED DUCT WORK FROM WATER INFILTRATION AND/OR CONDENSATION

NO. 159 – SECOND FLOOR ROOM 221 – WATER STAINED DUCT WORK FROM WATER INFILTRATION AND/OR CONDENSATION

NO. 160 – SECOND FLOOR ROOM 225A – CHEMICALLY STAINED FURNITURE AND FLOOR FINISHES

NO. 161 – SECOND FLOOR ROOM 225A – CHEMICALLY STAINED FURNITURE AND FLOOR FINISHES

NO. 162 – SECOND FLOOR ROOM 225A – CHEMICALLY STAINED FURNITURE AND FLOOR FINISHES

NO. 163 – SECOND FLOOR
ROOM 225 – CRACKED INTERIOR
CONCRETE MASONRY WALL

NO. 164 – SECOND FLOOR
ROOM 225 – CRACKED INTERIOR
CONCRETE MASONRY WALL

NO. 165 – SECOND FLOOR
ROOM 225 – CRACKED INTERIOR
CONCRETE MASONRY WALL

NO. 166 – ROOF VIEWS FROM THE NORTHEAST CORNER

NO. 167 – ROOF VIEWS FROM THE NORTHEAST CORNER

NO. 168 – ROOF VIEWS FROM THE NORTHEAST CORNER

NO. 169 – ROOF VIEWS FROM THE EAST EDGE

NO. 170 – ROOF VIEWS FROM THE EAST EDGE

NO. 171 – ROOF VIEWS FROM THE EAST EDGE

NO. 172 – ROOF VIEWS FROM THE EAST EDGE

NO. 173 – ROOF VIEWS FROM THE SOUTHEAST CORNER

NO. 174 – ROOF VIEWS FROM THE SOUTHEAST CORNER

NO. 175 – ROOF VIEWS FROM THE SOUTHEAST CORNER

NO. 176 – ROOF VIEWS FROM THE SOUTH FACE

NO. 177 – ROOF VIEWS FROM THE SOUTH FACE

NO. 178 – ROOF VIEWS FROM THE SOUTH FACE

NO. 179 – ROOF VIEWS FROM THE SOUTH FACE

NO. 180 – ROOF VIEWS FROM THE SOUTH FACE

NO. 181 – ROOF VIEWS OF A SOUTH PARAPET

NO. 182 – ROOF VIEWS OF A SOUTH PARAPET

NO. 183 – ROOF VIEWS FROM THE SOUTHWEST CORNER

NO. 184 – ROOF VIEWS FROM THE SOUTHWEST CORNER

NO. 185 – ROOF VIEWS FROM THE SOUTHWEST CORNER

NO. 186 – ROOF VIEWS FROM THE SOUTHWEST CORNER

NO. 187 – ROOF VIEWS FROM THE WEST FACE

NO. 188 – ROOF VIEWS FROM THE WEST FACE

NO. 189 – ROOF VIEWS FROM THE WEST FACE

NO. 190 – ROOF VIEWS FROM THE WEST FACE

NO. 191 – ROOF VIEWS FROM THE WEST FACE

NO. 192 – ROOF VIEWS FROM THE NORTHWEST CORNER

NO. 193 – ROOF VIEWS FROM THE NORTHWEST CORNER

NO. 194 – ROOF VIEWS FROM THE NORTHWEST CORNER

NO. 195 – ROOF – PONDING WATER

NO. 196 – ROOF – PONDING WATER

NO. 197 – ROOF – PONDING WATER

NO. 198 – ROOF – PONDING WATER

NO. 199 – ROOF – PONDING WATER

NO. 200 – ROOF – PONDING WATER

NO. 201 – ROOF – SHARP FOREIGN DEBRIS

NO. 202 – ROOF – SHARP FOREIGN DEBRIS

NO. 203 – ROOF – SHARP FOREIGN DEBRIS

NO. 204 – ROOF SKYLIGHT/MECHANICAL ENCLOSURE – DETERIORATED JOINT SEALANTS ALLOWING WATER INFILTRATION

NO. 205 – ROOF SKYLIGHT/MECHANICAL ENCLOSURE – DETERIORATED JOINT SEALANTS ALLOWING WATER INFILTRATION

NO. 206 – ROOF SKYLIGHT/MECHANICAL ENCLOSURE – DETERIORATED JOINT SEALANTS ALLOWING WATER INFILTRATION

NO. 207 – ROOF SKYLIGHT/MECHANICAL ENCLOSURE – DETERIORATED JOINT SEALANTS ALLOWING WATER INFILTRATION

NO. 208 – ROOF SKYLIGHT/MECHANICAL ENCLOSURE – LOOSE FRAMING ALLOWING WATER INFILTRATION

NO. 209 – ROOF SKYLIGHT/MECHANICAL ENCLOSURE – LOOSE FRAMING ALLOWING WATER INFILTRATION

NO. 210 – ROOF SKYLIGHT/MECHANICAL ENCLOSURE – TYPICAL CONFINED SPACE ACCESS

NO. 211 – ROOF SKYLIGHT/MECHANICAL ENCLOSURE – TYPICAL CONFINED SPACE ACCESS

NO. 212 – ROOF SKYLIGHT/MECHANICAL ENCLOSURE – WATER DAMAGED INTERIOR FINISHES

NO. 213 – ROOF SKYLIGHT/MECHANICAL ENCLOSURE – WATER DAMAGED INTERIOR FINISHES

NO. 214 – ROOF SKYLIGHT/MECHANICAL ENCLOSURE – WATER DAMAGED INTERIOR FINISHES

NO. 215 – ROOF SKYLIGHT/MECHANICAL ENCLOSURE – WATER DAMAGED INTERIOR FINISHES

NO. 216 – ROOF SKYLIGHT/MECHANICAL ENCLOSURE – WATER DAMAGED INTERIOR FINISHES

Appendix D
MEP Facility Assessment

Facility Condition Assessment

for

UNCC Burson Building
Charlotte, NC

Prepared by:

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2127 Ayrsley Town Blvd, Suite 300
Charlotte, NC, 28273

August 20, 2013

Executive Summary

Overview

UNCC commissioned Stantec to assess the existing mechanical, plumbing, fire protection and electrical systems in the existing Burson Building located at the University of North Carolina, Charlotte campus. Deficiencies are to be identified and recommended corrective measures are to be provided.

This report provides a summary of findings indicating Stantec's recommendations addressing the observed deficiencies.

The property consists of approximately 100,000 gross square feet of area distributed on two main levels and a small addition below grade. There is ~79,080 net square feet and ~72,935 net assignable area. Net assignable area excludes mechanical, electrical and plumbing equipment areas as well as public restrooms, janitor's closets, general storage rooms and similar spaces not considered as usable space in a building.

The original building was constructed in 1985. The small addition was constructed later in 1985.

Stantec conducted a site visit at the property on June 18th and 21st, 2012. We met with the laboratory manager and limited facilities personnel from the property. We walked through and reviewed the building areas which specifically dealt with the requests of the Client, as well as provided a general engineering review.

Overall, the majority of the equipment has reached or is nearing its useful serviceable lifespan.

There are multiple deficiencies and operational problems/concerns that should be addressed.

Mechanical

Mechanically, the HVAC systems, including the fume hoods, are beyond their serviceable life expectancy with the exception of the recently installed chiller (2011) and standby boiler (2008) for summer operation.

The remaining systems require a complete controls and air balance calibration. This calibration, especially for the controls, should occur on a regular basis. While some of the controls have been upgraded to DDC electronic with a building management system (BMS), the remaining existing pneumatic controls are antiquated in comparison to what is available in direct digital controls (DDC) today. The BMS interface is highly recommended to be updated and utilized to alert facilities personnel of any problems that may occur so that they are promptly addressed.

Without the BMS, it may be days or even weeks before a problem is recognized and corrected. The testing, adjusting and balancing portion of the work is recommended to be a direct hire of the University to ensure the best quality results. A select group of AABC or NEBB certified contractors could be recommended.

The building has insufficient exhaust at the student hoods from the original design, potentially insufficient and poorly controlled makeup air to the large fume hoods and no make-up air to the student hoods resulting in a negatively pressurized building, and the roof is leaking water, all which can lead to mold growth and poor indoor air quality. The ductwork likely leaks beyond today's industry standards resulting in poor exhaust performance at the room/hood level and in fans that may be operating in their motor's service factor rating.

There is a concern of fume hood exhaust and its effect on adjacent buildings' fresh air intakes.

The outside air intake for the primary air handling unit of the building is located near the loading dock which occupants have reportedly complained of vehicle exhaust fumes. As noted in the plumbing section, the natural gas pressure reducing valve also appears to vent gas heavily at times contributing to the smell and potential for poor indoor air quality.

There is presently no reported 'working' means of measuring outside air coming into the primary air handler to assure proper building balance and pressurization. Although an outside air flow measuring station is shown on the record drawings, it would appear it is no longer reliable.

The organic chemistry teaching labs should be equipped with 3 linear feet of fume hood for each student, with a current 80% deficiency rating. The remaining lab areas should be evaluated to determine their fume hood needs and modifications made accordingly.

It is recommended that the storage of chemicals be in vented enclosures to best contain the fumes; currently, the chemicals are on open shelves and fill some of the rooms. While this can be dealt with, it requires much more in the way of air changes and energy to provide proper ventilation.

<u>Plumbing</u>

As for the plumbing, the issues are mostly from a problem and deficiency standpoint.

The primary roof drainage system seems adequate with water standing only where the roof slope is inadequate for drainage. The secondary roof drainage (or emergency overflow drains) is handled by roof scuppers installed at the base of the roof perimeter parapet wall.

The toilet room fixtures are the original fixtures and are not of the water saving, high efficiency, type. Toilet rooms were laid-out before ADA requirements and need to be upgraded to current codes.

The currently installed hot water heater system is inoperative due to what is believed to be issues with a combined flue and combustion air vent.

There is poor water pressure in some of the lab spaces that requires further study, possibly pipe resizing and/or introduction of a booster pump.

There is no backflow prevention on domestic piping entering the building.

The acid waste, while provided with acid waste piping at the user level, combines with the general sanitary sewer without acid neutralization when it leaves the building. There is reportedly an acid waste disposal policy in place at UNCC that prevents acid waste from being dumped down the drain.

There are two natural gas services for the building; one serves the labs, and the other serves the water heaters and a small steam boiler. The natural gas pressure reducing valves are located in front of the outside air intakes that serve the main air handler of the building. The valves must be venting heavily at times as gas was smelled at the time of the site survey. The valve discharge should be vented up to above the roof level.

There is a de-ionized (DI) water system located in the first floor main mechanical room that serves only the research labs. The DI system is a non-circulating type and only delivers water from a local pump.

There is a lab compressed air system that provides compressed air to the laboratories.

Any need for specialty gases are provided at the point of use with portable DOT cylinders. The primary specialty gas used is nitrogen. Liquid nitrogen cryogenic tanks are also utilized for the industrial MRI.

Fire Protection

Building is currently not equipped with any automatic fire suppression systems. NFPA 45 “Standard on Fire Protection for Laboratories Using Chemicals” classifies this as a Class C laboratory and requires sprinkler protection and further recommends that hose standpipes be provided. If any renovations are to be made to this building, sprinklers will be required and the case for a fire pump will need to be reviewed.

Building is currently equipped throughout with portable ABC fire extinguishers. Several type D fire extinguishers were seen located in the corridors.

Electrical

The electrical system for this building is loop feed from the campus grid at 12,470 volts with pad mounted S&C switches and distribution transformers to reduce the voltage to service entrance levels of 277/480, 120/208 volts. There are three (3) primary Westinghouse switch boards mfg.

in 1984, one (1) at the 277/480 voltage level, rated at 1600 amps “SBA”, and two (2) at the 102/208 voltage level, rated at 2500 amps “SBB” and “SBC”. This service entrance gear appears to be in fair condition. The distribution is completed by feeds out from this gear to sub-panels located with-in the building.

Generated emergency power is supplied by a small diesel generator for life safety functions only.

Lighting with-in the building appears to be predominantly T12 type fixtures with lower than required light levels in many areas. As areas have been renovated in the past, lighting has been modified and improved with more energy efficient and better light levels using newer T5 and T5HO fixtures.

Fire alarm system with-in the building has been upgraded in the recent past to a modern addressable zone type system. This system consists of Simplex 4020 controller with voice command.

Table of Contents

1.0 Introduction

UNCC commissioned Stantec to provide a feasibility study for the Burson Building at the UNCC campus with the following priorities in mind:

1. Provide recommendations to correct the existing deficiencies associated with the existing building infrastructure, especially those involving the heating, ventilation and air conditioning system.

2. Provide contemporary state-of-the-art chemistry instructional labs for freshmen.

3. Create additional faculty research space with appropriate area, appurtenances and infracstructure.

1.1 BACKGROUND

The property consists of a 2-story building constructed in 1985.

The majority of the equipment is original to 1985 building construction with the exception of the chiller, secondary boiler, water heaters and make-up air rooftop units with plate and frame heat exchanger.

1.1.1 History

Overall, the original equipment has reached or is nearing its useful serviceable lifespan. The labs and the toilet room layouts are the original design. They are not accessible and need to be updated to current accessibility standards.

1.1.2 Basis of Information

The report is based on information gathered from the following sources:

- Available documentation from the building. This predominantly includes record drawings.

- Discussions with the Laboratory Manager, Director of Engineering and facilities personnel.

- On-site field surveys of the building and installed equipment.

1.1.3 Site Conditions

The weather during the two days of site surveying was in the low to mid 80's F on 6/18/2012 and on 6/21/2012 with fair but hot and humid conditions.

1.1.4 Site Investigation

The site investigation included direct observation of installed systems where such observation did not interfere with the normal operation of the building systems or its tenants. Observations did not include detailed inspections of equipment, especially those that require implementation of safety procedures, such as opening of energized electrical equipment.

1.1.5 Qualifications

No testing, exploratory probing, dismantling, operating of equipment or in-depth studies were performed unless specifically required. This Assessment did not include engineering calculations to determine the adequacy of the Property's original design or existing systems. Although walk-through observations were performed, not all areas were observed. There may be defects in the Property, which were in areas not observed or readily accessible, may not have been visible, or were not disclosed by management personnel when questioned. The report describes property conditions at the time that the observations and research were conducted.

2.0 Engineered Systems Review and Recommendations

2.1 MECHANICAL SYSTEMS

2.1.1 Water Cooled Chiller

Reportedly after sitting idle for 3-4 years, the chiller was replaced in 2011 with a variable speed, tri-rotor screw, 460 volt 3 phase, Carrier 500 nominal ton, 485 actual ton, model 23XRV4141NRVBA5 machine. The leaving chilled water temperature is currently 44 degrees F and the entering is currently 57 degrees F. The leaving condenser water temperature is 96.5 degrees F and the entering condenser water temperature is 83.1 degrees F. The evaporator flow rate is capable of 1164 gpm and the condenser flow rate is capable of 990 gpm. The chiller is charged with 750 pounds of R134A refrigerant. The chiller selection was purposely oversized for future cooling needs. The chiller is estimated to run at 67% on a peak day in the present. The efficiency is estimated at .546 kW/ton at the 67% loading and .633 kW/ton at the future full load. The feeder is reportedly undersized at 600 amps where it should be 800 amps. Some sources indicate this chiller cannot go above 60% of its operation.

The serviceable life expectancy of this quality of chiller is approximately 25-30 years per ASHRAE. The unit should not require replacement until ~2036, with good maintenance in the interim, assuming no issues with the utilized refrigerant R134A arise. R134A is known to be a Global Warming Potential (GWP) but not an Ozone Depletion Potential (ODP). Some countries are looking at banning some of the GWP refrigerants but the United States is currently not one of them.

The unit is reportedly oversized so it should accommodate some growth of the Burson Building infrastructure.

It is surprising that the chiller kW/ton ratings are not better than what was documented in the record drawings. A trend should be established through the controls to verify the peak and average loading and kW/ton operation of each. It is likely that the unmatched cooling tower results in energy losses for this unit.

It is understood from the record drawings that the pumps, piping and cooling tower were not replaced with the installation of the new chiller. The condenser water flow rate of 990 gpm was made to match up with the existing 330 ton cooling tower. Modeling should be acquired from Carrier to determine what happens given the record values indicated.

A qualified TAB contractor should measure the existing flow rates of the pumps. The chiller controls may also provide the flow rate information in the packaged controls. The TAB contractor would verify the calibration is correct.

In the future, when the additional tonnage is required, the pumps will require replacement as well as the cooling tower that presently remains at 330 tons. The record information indicates that the chilled water flow rate will be modified from 528 (15 degree delta) to 1164 gpm (10 degree delta) and that the condenser water flow rate will remain at 990 gpm, going from a 10 degree delta to a 14 degree delta. Modeling should be acquired from Carrier to determine what happens given the record values indicated. It is possible this was modeled at the Carrier chiller plant in Charlotte and records may be available. Assuming the modeling is reviewed as acceptable, the chilled water piping will have to increase in size from 6" to 8" to prevent pipe erosion, to ensure energy efficient operation at the higher flow rates and to keep pipe noise within tolerable limits. The condenser water piping would not require upsizing but it will soon require replacement due to corrosion and poor chemical treatment.

It is observed on the 2002 record drawings that 8" chilled water is run to the Burson 6" chilled water main header from the CARC (Cameron) Building. Likewise with the chilled water return line. There are Onicon flow meters on each line. A trend from these meters should be established to determine true building peak cooling ton usage.

Also the 5" chilled water mains in Burson that used to go to and from a removed air cooled chiller have been tied into the Burson 6" main headers for a future connection. This is in the same location as one of the AAON units, but the AAON unit is tied to the glycol chilled water loop from the roof with the piping exposed on the side of the building.

At the time of the 2002 drawings, Cameron Building provided the cooling needs for Burson Building with Cameron's Chiller #3 being the lead chiller due to its efficiency. Chiller #1 would pick up the load if Chiller #3 went offline.

When the new single Burson chiller was added in 2011, no mention is given regarding the Cameron chillers in the updated control sequence on the record drawings. The Burson chiller system would seem to have no equipment redundancy in place in the building. Redundancy is provided, however, by opening the chilled water lines in place that are connected to the adjacent Cameron Building where sufficient cooling tonnage is reportedly available, even on a peak day. There is reportedly a newer York and an older Trane centrifugal chiller in Cameron that are sized to handle both buildings on a peak day, independently. One is reportedly redundant to the other. The York machine is the preferred chiller and runs most frequently. If the Burson Building were to gain additional square footage or load, the redundancy may be jeopardized to some degree but load shedding could likely occur if needed. Without the Cameron Building tie-in and if the Burson chiller, cooling tower or a chilled water or condenser water pump were to go offline, the building environment would drift toward ambient temperature and humidity conditions until a repair is made. This may cause some problems with ongoing experiments which require stable air conditions. Redundancy is recommended for this level of scientific building but would be required on all four fronts as well as emergency power if it is deemed to be that important.

The exhaust system, identified as a 'sniffer' exhaust on the record drawings, should be tested to ensure the exhausted air is not reintroduced into the mechanical room through the outside air intake it currently resides in. A small smoke test during unoccupied times should verify the correct operation. The exhaust does not appear to be ducted per the record drawings, regarding the discharge location. Additionally, the louver that is open to the mechanical room was originally intended to be a relief air louver. It is currently being utilized as an additional outside air louver, reportedly to maximize the make-up air to the building. As a result, any refrigerant leaks of the chiller would be drawn into the air handling system and distributed throughout the building. This is a health risk and should be corrected immediately.

Alarms and Self Contained Breathing Apparatus (SCBA) are not, but should be, in place. The SCBA reportedly is reportedly not required because the fire department is in charge of handling the emergency. It is assumed that the local jurisdiction in is approval and the fire department is aware of the system and educated on how to deal with such an event.

The refrigerant monitor in place was turned off at the time of our investigation. When it was turned on by facility staff, it shows a steady fault. It would appear that the monitor was apparently turned off in lieu of being repaired or until the repair could be made. Lack of refrigerant monitoring is a code violation and can result in a health risk. The monitor should be repaired or replaced immediately. The sensors should be checked to ensure the proper refrigerant gas is being monitored.

Remaining current ASHRAE 15 compliance should be verified.

2.1.2 Chilled Water Pumps

The primary chilled water pumps are original to the building, installed in 1985. The serviceable life expectancy of a base mounted pump is 20 years per ASHRAE, with good maintenance. The pumps are +7 years beyond their useful serviceable life.

There are two primary chilled water pumps, P-1 and P-2, originally designed to run in parallel rated for 264 gpm each at 35 feet of head. Motors are 5 HP, 460 volt, 3 phase.

In 1998, the impellers of these pumps were modified, according to the record drawings, to increase the gpm flow rate to 284 at 48 feet of head. This should be confirmed by TAB as Facilities were not certain this task was performed.

In 1996, another primary pump, CP-1, was installed to serve a glycol loop system for the rooftop make-up air handling units installed at that time. CP-1 was designed for 360 gpm at 55 feet of head. This 'combined' loop was equipped with an air cooled chiller loop for cooling water, a heat exchanger loop for heating hot water and a dual temperature loop for supply to the air handling equipment on the roof. The heating and dual temperature loops had their own pumps as well.

In 1998, CP-1 was modified, per record drawings, to 360 gpm at 60 feet of head. The air cooled chiller was removed and a new plate and frame heat exchanger was installed. The pump rebalance should be confirmed by TAB as Facilities were not certain this task was performed.

The pumps do not presently provide redundancy.

P-1 and P-2 are not sized to match the screw chiller tonnage of 485 tons.

It is recommended, at a minimum, that these pumps be provided with a redundant and energy efficient solution sized for future growth.

2.1.3 Cooling Tower

The cooling tower is understood to be original to the building. It is a Marley Model 8810 installed in 1985. The serviceable life expectancy of this type of cooling tower is approximately 20 years per ASHRAE, with good maintenance. This unit is past its life expectancy which expired in 2005.

The condenser water flow through this cooling tower is 990 gpm with 95 degree F entering water and 85 degree F leaving water. Anticipated ambient wet bulb temperature was 78 degrees. The fan has a 20 HP, 2-speed motor. The tower basin is equipped with a 10 kW, 460 volt, 3 phase heater.

The tower appears to be in fair condition. The tower was reportedly rebuilt as the new chiller was installed in 2011. New fill and linings were installed. The chiller and cooling tower had reportedly set idle for approximately 3-4 years in the time before the chiller was replaced. During this period, the chilled water was utilized from the adjacent Cameron Building. The piping is original to the building and is in poor condition. The heat trace on the exterior piping failed many years ago and the insulation is in disrepair. It is believed that any sump heaters are non-functional. Facilities reportedly de-energize this tower and drain the piping in the wintertime.

Chemical treatment is reportedly not routinely performed and the condenser piping and tower system are suffering as a result.

The tower has no strainers on the incoming piping so the hot deck reportedly gets clogged with scale from the piping system.

There is concern how well the tubes in the new chiller are protected.

It is recommended that twin towers be installed of sufficient capacity to provide redundancy and future growth capabilities, as well as energy efficiency. Variable speed drives should be evaluated for optimized savings. Strainers should be provided as well as routine chemical treatment by a reputable distributor for system longevity. Sump heaters and piping heat trace should be considered for wintertime operation, pending a review of the Cameron chiller system that is linked with this plant.

2.1.4 Condenser Water Pumps

The condenser water pumps are original to the building, installed in 1985. The serviceable life expectancy of a base mounted pump is 20 years per ASHRAE, with good maintenance. The pumps are +7 years beyond their useful serviceable life.

There are two pumps, P-3 and P-4, designed to run in parallel rated for 495 gpm each at 40 feet of head. Motors are 7.5 HP, 460 volt, 3 phase.

The impellers were replaced in 2011 after the new chiller was installed and the cooling tower refurbished.

The pumps do not presently provide redundancy, nor are they sized to match the chiller tonnage of 485 tons.

It is recommended, at a minimum, that these pumps be provided with a redundant and energy efficient solution sized for future growth. Net Positive Suction Head (NPSH) needs to be evaluated carefully on any new selection to avoid pump cavitation.

2.1.5 Central Air Handling Unit

The central air handling unit is a variable volume built-up unit original to the building. The serviceable life expectancy of this type of AHU system is 20-25 years per ASHRAE, with good maintenance and regular cleaning and recalibration of the controls, etc. The most likely elements to become outdated or require replacement first are the controls in a built-up unit. This unit should be replaced in its entirety.

This system is equipped with a single belt-driven 49” Trane, double width, airfoil bladed supply fan rated at 96,000 cfm and 5.1” TSP, powered by a 480 volt, 3 phase, 150 HP motor with a fan rotation speed of 945 rpm. Inlet guide vanes were the base bid and VFD was an alternate originally. It appears VFDs were installed in year 2000 when Johnson Controls took over the control interface, via DDC. It is uncertain if the motors are inverter duty which Facilities should verify. VFDs should be operated with inverter duty motors.

The return fan is similar, being a single belt-driven 49” Trane, double width airfoil bladed fan rated at 79,175 cfm and 1” TSP, powered by a 480 volt, 3 phase, 40 HP motor with a fan rotation speed of 630 rpm. Inlet guide vanes were the base bid and VFD was an alternate originally. It appears VFDs were installed in year 2000 when Johnson Controls took over the control interface, via DDC. It is uncertain if the motors are inverter duty which Facilities should verify. VFDs should be operated with inverter duty motors. It should be noted here that we were informed at the time of our visit that several of the return air grilles in the labs were closed off at some point in time, apparently 1998 according to the record drawings, to prevent the problem of recirculating fumes from the lab throughout the building.

The cooling coil consisting of a (6) six coil bank is rated for 96,000 cfm, EAT condition of 78.5 degree F DB and 65.7 degree F WB with an LAT of 51.5 degree F DB and 51.5 degree F WB, totaling 4052 Mbh capacity with a 15 degree chilled water delta entering at 45 degrees F and exiting at 60 degrees F. The face velocity is 535 fpm, high for an initial velocity. Once dirt accumulates, the velocity becomes higher and carryover may become a problem. The coil water pressure drop was rated at 16.5’ and the air pressure drop at 1.1”, both reasonable values. The cooling coils were reportedly last cleaned approximately 3 years ago.

Free air side cooling was made available from an enthalpic economizer originally, per the record drawings. In order for an enthalpic economizer to work well, its associated humidistat measuring the various airstream and ambient conditions needs to regularly recalibrated. The airflow measuring stations also have to be working well to ensure proper airflows and building air balance are maintained.

According to Johnson Control record drawings from year 2000, it would appear that this unit’s controls were updated with DDC controls. According to these documents, chilled water runs continuously through the AHU coil, with the coil bypass damper modulating to maintain supply air setpoint. This appears to be rather wasteful and likely leads to quicker coil erosion over time, compared to a modulating control valve on the water side. During economizer mode, the air is being made colder due to some of the air passing through the coil, again wasteful, and not typical free cooling. It appears that the unit operates only in dry bulb economizer only now as a result of this control update. As noted previously, the unit originally had an enthalpic economizer.

The steam preheat coil at 18’ wide x 4’ high is rated for heating a minimum 22570 cfm of outside air from a design winter dry bulb temperature of 15 degrees F to a leaving temperature of 55 degrees F. It is reportedly a freeze proof design, sized to accommodate up to 72,000 cfm during economizer mode. The coil uses 30 psig steam at 975 lbs/hr. This coil was reportedly last cleaned 3-4 years ago. Access to this coil is difficult.

It was reported that this preheat coil was utilized very little which is odd considering the amount of outside air reportedly needed to make up for the building’s exhaust needs. It may be that the AHU is returning too much air which may be exacerbating the negative pressure problem of the building. It would be expected that in the wintertime, the mixed air temperature would be low enough to require preheat of the airstream. An overall building TAB report would be extremely beneficial in determining the building air balance but none are reportedly available.

Fan and outside air control, per the Johnson Controls year 2000 record drawings, may be lacking. Air flow measuring and/or building pressurization measurements are not utilized; therefore, maintaining the required minimum outside air for hood makeup is likely not occurring. Bringing back too much return air is emblematic of the problem.

There is a previously reported concern of the fumes from standing vehicles at the loading dock entering the outside air intake of this air handling system. Some UNCC parties seem to indicate the loading dock is not used anymore but Facilities indicates that the oxygen tank truck, garbage/recycling truck still utilize the loading dock. At the same time, the Facility personnel are not aware of any odor complaints. It would be recommended to consider carbon filters specifically designed to absorb fumes of this nature, if they are a recurring problem. They could be installed preferably downstream of the prefilters or final filters in a new rack to maximize their effective life.

It was observed that the relief air louver section in the exterior wall is currently being utilized as an outside air intake in an attempt to maximize the amount of outdoor air coming into the air handling system. Gas fumes were smelt inside the mechanical room from the gas train PRVs immediately outside. Using this louver as an outside air intake also makes it difficult for the refrigerant evacuation system to work properly and if the chiller were to lose its charge in the room, the refrigerant would be circulated throughout the building.

The filters utilized should be reviewed. ASHRAE rated MERV 8 prefilters and at least MERV 10 final filters are recommended to be used to keep soils and keep systems as clean as possible for optimal efficiency. The record drawings seem to indicate only 30% efficient filters are used at best but maybe better filters are incorporated today. The filters in place were observed, being 2” pleated media but the MERV rating or model number were not on the filter casing. Filter bypass was observed as the velocity across the coil bank seemed excessive. A TAB report for this unit, currently unavailable, would be helpful in further diagnosis.

Air flow measuring stations appear to be original, installed in 1985, pitot tube arrays with honeycomb straighteners. Upon our initial site visit, maintenance was unaware what the very dirty honeycomb straighteners were for. It is likely that the pitot tubes are not properly measuring airflow and thereby not performing their vital function of maintaining proper airflows, ventilation, make-up air and air balance within the building. Maintenance indicated on the day of our visit that once they cleaned one of the straighteners recently, the airflow delivery was improved. The airflow measuring stations do not appear to have been altered or utilized when Johnson Controls took over the controls, via DDC, in year 2000. Access to the building management controls access for this AHU were not available at the time of our visits.

It was noted in the 2002 record drawings that the control valves serving the cooling coil banks in the central AHU are to be modulating when the CARC chiller is providing the chilled water but full open when the Burson chiller is providing the chilled water. This would be reviewed as a potential 3+ degree difference in chilled water supply temperature perhaps.

Facilities reports that they need to keep the AHU leaving air temperature no lower than 55 degrees to prevent condensation issues within the building envelope due to the infiltration problem they are experiencing.

2.1.6 Steam Pressure Reducing Valve Station and Flash Tank

The existing steam pressure reducing valve station and associated flash tank appear to be original to the building. The serviceable life expectancy of the specialties in this station is no more than 20 years per ASHRAE, with good maintenance, leaving this equipment +7 years beyond its recommended replacement.

This PRV (pressure reducing valve) station originally brought in 125 psig steam from the campus loop, reduced it to 30 psig in the first stage and finally from 30 to 5 psig in the final stage. Presently, the PRV station is offline and a local gas-fired steam boiler is producing the steam. Reportedly, the PRV station will be made active again in the fall when the central plant will be delivering steam to the building.

Reportedly, the middle stage of the PRV is only maintaining 10 psi, per the facility staff. This would explain why they have heating problems in the winter time, it was observed to have been heard.

The steam pressure relief valve discharge piping is located in a manner that if it discharges, the steam is drawn in through the louver that once was relief but is now outside air. If this occurs, the mechanical room may quickly fill up with steam.

This PRV station and flash tank should be replaced in their entirety not only for performance and reliability reasons but also for safety reasons as leaking steam, especially at high pressures, can be very dangerous, even deadly. This equipment’s current condition is very poor.

The insulation on the PRV station is in very poor condition.

2.1.7 Steam Condensate Pumping System

The existing condensate tank and pumps appear to be original to the building. The serviceable life expectancy of this system is 15 years per ASHRAE, with good maintenance.

The service record of these pumps should be reviewed and the system analyzed to determine if pump replacement, if not system replacement, is imminent. The system appears to be in very poor, if not inoperable, condition with overflows obvious from the extent of rusty residue in the vicinity.

The sizing of the tank and pumps should be re-evaluated and the pumps should be sized for 100% redundancy.

The condensate piping should be reviewed to see how much corrosion has occurred as well, considering the rust that was observed in the field.

It was reported by Facilities that this system no longer works or works very poorly. Steam that does not get pumped back to the plant is discharged to the floor drain. This is a code violation if the condensate temperature is greater than 140 degrees F. A drain cooler should be utilized where drainage is required. This loss of condensate down the drain reflects significant energy losses in the system that would be otherwise recovered, reducing overall system operating cost.

2.1.8 Supplemental Steam Boiler

In 2008, according to the record drawings, a gas-fired summer-run boiler was installed for Lab steam and reheat. The boiler generates 902 lb/hr of 12 psig steam using natural gas.

The boiler flue is tied into the (2) gas-fired water heater flues of the same vintage, with a flue gas booster fan. To date, the water heaters have had operational problems. There may be a associated problem with the boiler as well, yet to be determined. Initial observations may indicate that the combustion air ducting to the water heaters exceed the allowable pressure drop.

Facilities plan on discontinuing the use of central steam. It is recommended that this boiler be supplemented with additional boiler(s) to provide the capacity required and redundancy as well. It is recommended that the boilers be condensing high efficiency units for increased energy savings. Being low pressure units, new heat exchangers, sized for the applicable steam pressure should be introduced.

2.1.9 Heating Hot Water Heat Exchanger – Base 1985 Building Only

The existing shell and tube hot water heat exchanger is believed to be original to the building. The serviceable life expectancy of a heat exchanger of this type is 20-25 years. This unit has surpassed its useful life and should be considered for replacement.

The heat exchanger reportedly uses 30 psig steam to create hot water that is used for heating the building at the perimeter air terminal units.

The heating system may have to be re-evaluated in the new design to allow for tempering of minimum airflows to prevent overcooling problems and may have to become larger if the building area is increased.

2.1.10 Heating Hot Water Pumps – Base 1985 Building Only

The heating hot water pumps are original to the building, installed in 1985. The serviceable life expectancy of a base mounted pump is 20 years per ASHRAE, with good maintenance. The pumps are +7 years beyond their useful serviceable life.

There are two pumps, P-5 and P-6, designed to run in parallel rated for 35 gpm each at 75 feet of head. Motors are 3 HP, 460 volt, 3 phase.

The pumps do not presently provide redundancy.

The heating system may have to be re-evaluated in the new design to allow for tempering of minimum airflows to prevent overcooling problems and may have to become larger if the building area is increased.

2.1.11 HVAC Controls

While there are newer DDC electronic controls in place for the existing custom air handling unit, chiller and boiler, a large portion of the existing equipment still utilizes pneumatic controls.

The existing pneumatic controls and compressor appear to be original to the building except where complete failure has occurred. These 1985 era controls are +7 years beyond their serviceable life according to ASHRAE and assuming good maintenance throughout the years of service. Control technologies change rapidly which likely made many of the existing control elements obsolete long ago.

It was observed that many control elements have not been maintained over the years and the maintenance personnel seem to be in the process of catching up to all of the problems today. From air flow measuring stations covered in dirt to inlet guide vanes that no longer function, multiple dysfunctional items lead to a poorly controlled building, some of which may lead directly to the complaints heard to date.

Pneumatic lines should be checked to make sure there aren't any open ended lines or points of leakage that result in excessive running of the air compressor system and wasted energy.

The air compressor service record should be reviewed and the equipment analyzed to determine if a replacement need is imminent. It too, is beyond its useful service life.

It is recommended that the remaining controls be replaced with new electronic Direct Digital Controls (DDC). Invensys with the Tridium overlay are reportedly the current controls in place with possibly some remaining Johnson Controls components still under the Tridium. It is recommended that all control elements be upgraded DDC with a Building Management System (BMS) so setpoints, equipment operation status, pressure statuses, etc. can be monitored in real time with alarms being broadcast when any of the monitored components falls out of a previously assigned acceptable range.

Exhaust fans conveying hood fumes should be monitored for status.

Lab rooms should be monitored for negative pressure either by pressure controls or by monitoring the exhaust fan operation and the associated makeup air terminal cfm. Routine recalibration is important for either solution.

It may become necessary to keep lab doors closed to help maintain the negative pressurization of these spaces. Open doors require much more differential in airflow to maintain set pressures which can lead to operational difficulties and complaints.

The central air handling unit controls were reportedly converted to DDC in year 2000.

2.1.12 Fire Safety HVAC devices

The existing duct mounted smoke detectors should be reviewed, and regularly tested, to ensure they work properly. Given the condition of the airflow measuring stations, it is likely that the sampling tubes for the duct mounted smoke detectors may be clogged up as well leading to poor and possibly no smoke detection as required by the Code. The duct mounted smoke detectors for the central air handling unit were reportedly replaced in year 2000, according to Johnson Control record drawings.

2.1.13 Exterior Piping Heat Trace

This building was originally equipped with heat trace on piping subject to freeze outside. Heat trace has short serviceable life, ~10 years per ASHRAE, when in ideal conditions. Many areas of piping have been jeopardized due to heavily damaged or missing insulation.

The heat trace on the cooling tower condenser water piping has failed.

It is recommended that piping not containing glycol as a freeze preventative, be re-evaluated for modern heat trace and repair of the piping insulation.

2.1.14 Ductwork Systems

The low pressure ductwork in this building installed is likely poorly sealed with the exception of the medium pressure supply mains. This is because modern Code releases have made better duct sealing a more stringent requirement compared to minimal requirements previously. Poor sealing leads to excessive leakage, especially on long duct runs.

It is common to find especially return and exhaust systems leaking so much that the associated fans cannot be sped up to accommodate it. Space airflows are still not what the plans indicate. Sometimes, motors are left operating in the service factor getting as much flow as possible but still short.

If the leakage is excessive on the exhaust side, the outside air/make-up being pulled into the building needs to increase to ensure the building does not go negative in pressure resulting in poor indoor air quality and a risk for mold growth.

Many times, a designer does not accommodate for duct leakage in their fan, exhaust, return and make-up air calculations, when in reality, it is a necessity.

Ductwork pressure class is important in that if the ductwork sees pressures higher than it is constructed for, more leakage can result from the breakage of joints and or duct seals.

Presently, no Testing, Adjusting and Balancing (TAB) reports are understood to be available. A lab is a special building that should be routinely tested to ensure proper airflows and pressurization requirements are maintained. One cannot set it up now and expect it to remain in calibration for the next 5-20 years. Every 3 years or more often is a recommendation to check the airflows and controls to ensure everything is operating properly and to recalibrate sensitive control elements where necessary.

A qualified TAB Contractor should be considered to ensure proper airflows are provided for exhaust fan make-up requirements, ventilation air requirements, and to make the building slightly positive from the core to prevent infiltration and to help maintain negatively pressured labs.

An airflow test summary by a qualified TAB contractor would reveal where leakage is a problem, beyond industry standards. Typically, leakage rates beyond 10% should be addressed to prevent building pressurization problems which could result in unwanted infiltration and rsultiong humidity control issues and associated mold and mildew concerns. The TAB report would identify airflow sums at the air distribution and compare it to a travers, or airflow measured at or near the fan, to identify problem areas. Ductwork identified as a problem should be corrected by proper sealing or replacement.

All new ductwork of all pressure classes should be sealed to Seal Class A and tested for minimal leakage, no more than 10% in low pressure supply, return and general exhaust and no more than 5% in medium pressure supply and fume exhaust. The appropriate pressure class will need to be evaluated for each system to accommodate the requirement.

Once the building is more under control, it may become necessary to keep lab doors closed to help maintain the negative pressurization of these spaces. Open doors require much more differential in airflow to maintain set pressures which can lead to operational difficulties and complaints.

2.1.15 Air Terminal Units

The majority of air terminal units are original to the 1985 building with the exception of the make-up air boxes that were added in 1996 for the fume hoods.

The serviceable life expectancy of an air terminal box is 20 years per ASHRAE, with good maintenance. The original boxes are beyond their life expectancy by 7+ years and should be considered for replacement. DDC boxes with low voltage controls and 2 row hot water reheat should be considered for optimal control.

Originally, only the perimeter air terminal units were equipped with hot water reheat. In 1998 however, reheat was reportedly added to several existing interior zone units. It is likely this was due to these boxes supporting make-up air requirements and preventing the space from becoming over-cooled.

The majority, if not all, of the existing associated thermostats are at a non ADA compliant height.

Some of the existing air terminal boxes that were originally used for makeup air to the fume hoods have been closed due to condensation dripping on the ceilings. Reportedly, the ceilings did not originally exist in the associated spaces and when they were added, the make-up discharges were not extended to below or at ceiling. The ductwork should have been extended to a diffuser in the ceiling, all fully insulated. As a result of leaving the boxes above the ceiling, the cold surface temperature of the make-up boxes in the newly enclosed ceiling caused condensation to form, where it then dripped onto the ceiling surfaces. Closure of these boxes may have solved the condensation issue but resulted in a lack of proper make up airflow to the fume hoods, exacerbating the negative pressure problem present in the building. It is likely that these original boxes caused overcooling of the spaces as well as they did not have reheat and ran at a constant volume when an associated fume hood was switched on.

2.1.16 Fume Hood Exhaust Ductwork

Per NFPA, fire dampers should not exist in fume hood exhaust. There is a special procedure to follow for protecting any fire rated partition or barrier penetrations. Penetrations of fire rated assemblies will require a thorough review at the time of design.

Some of the existing fume hood exhaust ductwork is reportedly not welded steel and should be reviewed more closely.

2.1.17 Fume Hood Exhaust Fans

These fans appear to be original to the building from 1985.

The serviceable life expectancy of a centrifugal fan is 25 years per ASHRAE, with good maintenance. These fans, however, have been conveying corrosive-laden air and are much more likely to have a diminished lifespan unless properly equipped. If they are to remain, they should be replaced now and relocated to accommodate proper NEC and service clearance. The new fans should be properly selected for airflow, static, discharge plume height (as applicable), and material construction to withstand the chemicals in use. The flexible connections should also be designed for conveyance of said chemical fumes.

2.1.18 Student Hood and Spot/Snorkel Exhaust Fans

These fans appear to be original to the building from 1985.

The serviceable life expectancy of a centrifugal fan is 25 years per ASHRAE, with good maintenance. These fans, however, have been conveying corrosive-laden air and are much more likely to have a diminished lifespan unless properly equipped. If they are to remain, they should be replaced now with properly selected fans for airflow, static, discharge plume height, and material construction to withstand the chemicals in use. The flexible connections should also be designed for conveyance of said chemical fumes.

Originally, these fans were placed in-line, within the building envelope. This is not permitted today due to the discharge side of the exhaust fan being under positive pressure. This can result in leaking fumes back into the occupied space.

It appears that one of the Alternates to relocate the single speed, student fume hood exhaust fans from the ceiling level to the roof level was performed in 1996, as is observed today. This prevented the ductwork on the downstream side of the fan from being positively pressurized within the building envelope. Note that the fans were relocated with their arrangements modified and weather hoods provided for the motors, not replaced with new.

These fans still do not perform adequately to this day. The installations should be thoroughly reviewed and be replaced with a system that does meet the airflow requirements as well as be provided with adequate make-up air.

In 1998, backdraft dampers were added further reducing the fans' ability to pull the required airflow. Gravity dampers tend to stick over time. Motorized dampers should have the motor out of the airstream. Either can add from .3-.5" w.g. static pressure unless carefully selected.

It was observed that the student fume hood assemblies are constructed of plywood.

The metal exhaust duct taps the horizontal 'duct' made out of plywood. The cabinets were reportedly made at a shop on campus.

The inlets in the hoods are small but it was also observed, in several places, that the plywood top was warping away from the sides, causing significant 'horizontal duct' leakage upstream of the fume hoods.

Sheetmetal does not extend to the hood locations, just unsealed plywood cabinetry.

It is recommended that the student fume hoods be manufactured assemblies that are specifically designed and tested for the application needed to avoid liabilities and provide the required performance.

Reportedly, the make-up air for these systems does not exist. Further evaluation is required.

2.1.19 Fume Exhaust Discharge Concerns

Reading through previous reports, it appears that the fume hood exhaust locations are a matter of concern, as they should be. Today, fan manufacturers offer products with specially designed stacks for high discharge plume requirements. As the fans are relocated in the renovation/addition, they should be located in the most ideal location to prevent reintroduction to this or neighboring buildings fresh air intakes or operable windows but also be equipped with these specialized fan discharges to get the effluent to as high a plume height as is reasonable and possible.

2.1.20 Supplemental Rooftop Fume Hood Exhaust Booster Fans

In 1993, (6) six large rooftop upblast-configured, 460 volt, 3 phase, airfoil bladed, utility set type fans were apparently configured on the roof to assist the removal of the multiple fume hood exhaust fans serving the fume hoods. These fans range from ~25,000 cfm to ~36,000 cfm with .5” ESP. Horsepower ranges from 7.5 to 10.

In addition to providing a boost to the flow rate, they also would have provided a higher discharge plume, whether it was a consideration at the time or not. This is a good thing to discharge the air as high as reasonably possible so that it not affect nearby building intakes, window openings, etc. Modern laboratory fan design incorporate cones that produce the desirable plume heights needed to combat such concerns.

The serviceable life expectancy of a utility set fan is 20 years per ASHRAE, with good maintenance. These fans are at their life expectancy in 2013.

The fans appear to be situated properly to prevent unwanted system effect.

A ductwork plenum was created to contain the discharge air from each of the individual fume hood exhausters housed in the skylight area. The large utility set fans are tied into the plenum with adjustable, counter-balanced, backdraft dampers to maintain approximately ¼” w.g. negative pressure in the plenum. A rain hood and birdscreen was provided for the dampers.

Access doors were provided adjacent to the damper locations. These access doors are leaking considerably at present, with degraded weather-stripping, allowing water infiltration of the plenum and corrosion as a result. Some of the doors cannot even close properly.

A big disadvantage of this fan system is in the event the booster fan fails, several connected fume hoods lose their ability to properly expel their exhaust.

Another disadvantage is that these fans added horsepower and energy consumption to a system that should have worked properly in the first place.

2.1.21 Van De Graff Room in Basement

In 1985, a small basement room was added to the building which was equipped with a 208 volt, 1 phase Carrier spilt system heat pump. The system evaporator has 13,200 Btuh capacity total cooling, 10,000 Btuh sensible cooling at 80/67 EAT conditions. Supplemental heat is provided by way of a 3.75 kW electric heater.

This space is self-contained and has its own fresh air intake rated at 50 cfm.

The equipment, if original, is beyond its serviceable life expectancy, per ASHRAE, by approximately 12 years and should be replaced with modern, more energy efficient equipment with more environmentally correct refrigerants.

Facilities staff indicates the HVAC equipment is no longer in operation. They indicate that the floor drain is clogged and the condensate is not pumped; therefore, the system was de-energized.

It is recommended that if this space is utilized, the ventilation and conditioning needs to be made active to meet the building code. A condensate pump may be required if the floor drain cannot be made active again.

2.1.22 Make-up Air Handling Units on the Roof

In 1996, (6) six rooftop 100% outside air, make-up air handling units were installed on the roof of the Burson Building to provide partially conditioned make-up air to the fume hoods on the second floor. Essentially, a new central plant was created for this project. Following are details of each component of this new system.

a. Make-up Air Handling Units:

   As noted, (6) rooftop AHUs were added, varying in airflow from 5,910 to 15,340 cfm. The AHUs utilize chilled water for cooling and hot water for heating, through a common dual temperature pipe system. The units condition 100% outside air. The original design called for a 'cooling mode' conditioned air temperature of 64 degrees F DB and 63 degrees F WB. The 'heating mode' called for a conditioned air temperature of 75 degrees F. There is a dual temperature coil bank utilizing 2-way valves, so energy savings is not being utilized on the single dual temperature pump but it is only 5 HP in size. It is uncertain, today, what specifically triggers the control setpoint from cooling to heating mode and converts the dual temperature pipe system from heating to cooling, assumedly outside air temperature with some kind of dead band or manual changeover. Unless very carefully operated with humidity control in mind, dual temperature systems almost always result in sacrifice of comfort and humidity control in an effort to save on first costs.

   Facility personnel commented that the cooling conditioned air was not low enough to properly dehumidify the make-up air and resulting in high relative humidity in the space. A staff member present added that it adversely affects their experiments in the fume hoods that require a standard temperature and relative humidity. When asked what the standard needs to be, an answer was not clear. This should be researched further.

   It should be noted that the air cooled chiller and associated primary pump that were originally associated with this system are no longer in place. A plate and frame heat exchanger was reportedly added in 1998, per the record drawings, to use the primary building chiller to provide the water/glycol secondary loop with its capacity needs. The primary pump was re-utilized to serve the heat exchanger. The original rooftop AHU coils were designed for 45 degree entering water. The 1998 record drawing schedule indicates the water temperature leaving the plate and frame heat exchanger is ~53 degrees. This elevated water temperature could have a great impact on the dehumidification capability of the rooftop makeup air handling units. It is unknown if the AHU coils were re-evaluated with the higher EWT. The 2002 record drawings indicate the plate and frame was replaced again, this time using 42 degree F water on the primary side to create 45 degree water on the secondary side, to match what the Trane rooftop make-up air units were designed for. The LWT setpoint from the plate and frame needs to be further reviewed in the field and with facility personnel, as our observations still indicate 50+ degree water temperatures going to the AHUs.

An interesting side note is that the air cooled chiller was sized at 225 tons in this design. The existing building tonnage is 330. One would think they need 555 tons to control the building at peak conditions; however, a 485 ton chiller is installed and reportedly running at reduced capacity. The trend of this machine would be interesting to review. An overall TAB would be extremely enlightening. It is very possible that the Cameron chiller plant makes up for any short comings in cooling capacity.

The dual temperature pipe loop utilizes a 30% glycol solution to prevent freezing. While this practice is somewhat common for chilled water systems, it does sacrifice coil and pump performance as glycol/water mixtures are not as efficient as water alone. It is unclear why the piping was not routed inside the building up to the AHUs through a pipe vestibule or by utilizing heat trace. It is very uncommon to utilize glycol in a building heating system. The controls for converting the system from hot water to chilled needs to be carefully maintained so as to prevent too high a temperature of water from entering the chiller. Hot water reset is reportedly utilized so the changeover temperatures are not as drastic as they could be.

The dual temperature pipe insulation on the roof is in very poor condition and is leading to considerable unwanted energy losses.

The units are variable volume through the use of inlet guide vanes. It was reported by facility personnel that at least two of the unit’s inlet guide vanes were broken. Inlet guides commonly fail and are not recommended. Variable frequency drives are a much better way to vary system flow. Broken inlet guide vanes lead to uncontrolled AHU airflow delivery and various problems as a result.

The supply fan external static pressure was designed for 2”. This may have proven insufficient upon filter loading as that can easily add an inch to the system if not regularly replaced. These units are equipped with both pre and bag filters.

The fans on 5 out of the 6 units are forward curved which are less than ideal from a stability, energy savings and noise standpoint. Backward inclined and airfoil are much more preferred. The sixth unit utilizes an airfoil fan.

The AHUs deliver conditioned make-up to air terminal boxes, that were installed at the time, dedicated to each fume hood. As a fume hood's switch was energized, its associated exhaust fan was to come on and its air terminal box would open to the necessary cfm for conditioned make-up air.

The coils on the AHUs were reportedly replaced shortly after system start-up as it was reported that they froze when the contractor forgot to install the glycol into the system. Shop drawings were not readily available at the time of our visits to verify that the new coils were equals in performance to the original AHU scheduled coil performance. This should be verified if these units are to remain in operation because it may be a contributing factor to the present lack of performance reported in these units.

The serviceable life expectancy of rooftop air handling units of this type is 15 years per ASHRAE, with good maintenance. The units appear to be in relatively good condition despite their ~16 year age. It is likely, if this system were to remain in operation, that the units will require replacement in the next ~5 years.

b. Air Terminal Units

As noted, new air terminal units were introduced at this time (1996) to provide the conditioned make-up air to the fume hoods when the fume hood switch is activated. Low voltage, local only (non-BMS) electric controls are utilized on these units.

The serviceable life expectancy of air terminal units of this type is 20 years per ASHRAE, with good maintenance. The units appear to be in relatively good condition. It is likely, if this system were to remain in operation, that the units will require replacement in the next ~5 years.

c. Steam Pressure Reducing Valve Station

A new steam pressure reducing station was introduced at this time (1996) to provide heating capacity for the new heating hot water loop. The station reduces 125 psig steam from the central plant to 30 psig.

The serviceable life expectancy of the specialties in this station is no more than 20 years per ASHRAE, with good maintenance, leaving this equipment ~5 years from its recommended replacement.

Reportedly, the PRV is only maintaining 10 psi, per the facility staff. This would explain why they have heating problems in the winter time, it was observed to have been heard.

The steam pressure relief valve discharge pipe is located in a manner that if it discharges, the steam is drawn in through the louver that once was relief but is now outside air. This was reported to have occurred by the facility personnel, filling the mechanical room with steam.

d. Heating Hot Water Heat Exchanger

This shell and tube hot water heat exchanger was installed in 1996. The serviceable life expectancy of a heat exchanger of this type is 20-25 years. This unit is ~5-10 years from its recommended replacement.

The heat exchanger reportedly uses 30 psig steam to create hot water that is used for providing heat to the rooftop make-up air handling units through the dual temperature piping with glycol.

The heating system may have to be re-evaluated in the new design to allow for tempering of minimum airflows to prevent overcooling problems and may have to become larger if the building area is increased.

e. Chilled Water, Dual Temperature and Heating Hot Water Pumps

All three pumps were designed for use with 30% glycol solution in water.

The single chilled water pump, CP-1, is used in conjunction with a plate and frame heat exchanger to provide cooling water for the rooftop makeup air units. The screw chiller primary cooling loop is used to provide the cooling for the CP-1 cooling glycol loop. Refer to the chilled water pumps section earlier in this report. The single chilled water pump was installed as part of this design in 1996. The serviceable life expectancy of a base mounted pump is 20 years per ASHRAE, with good maintenance. The pump will likely need to be considered for replacement within the next ~5 years.

The single dual temperature water pump, CP-2, was installed as part of this design in 1996. The serviceable life expectancy of a base mounted pump is 20 years per ASHRAE, with good maintenance. The pump will likely need to be considered for replacement within the next ~5 years. The pump, CP-2, was originally rated for 301 gpm at 45 feet of head. Motor is 5 HP, 460 volt, 3 phase. The pump does not presently provide redundancy. Pump flow was rebalanced/increased to 360 gpm according to the 2002 record drawing when the second plate and frame heat exchanger was introduced. Other pump specifics, such as PD, at the new flow rate do not appear on the record drawing.

The single heating hot water pump, CP-3, was installed as part of this design in 1996. The serviceable life expectancy of a base mounted pump is 20 years per ASHRAE, with good maintenance. The pump will likely need to be considered for replacement within the next ~5 years. The pump, CP-3, is rated for 301 gpm at 35 feet of head. Motor is 5 HP, 460 volt, 3 phase. The pump does not presently provide redundancy.

f. Student Fume Hoods and associated Exhaust Fans

It appears that one of the Alternates to relocate the single speed, student fume hood exhaust fans from the ceiling level to the roof level was performed in 1996, as is observed today. This prevented the ductwork on the downstream side of the fan from being positively pressurized within the building envelope. Note that the fans were relocated with their arrangements modified and weather hoods provided for the motors, not replaced with new.

These fan systems still do not perform adequately to this day. The installations should be thoroughly reviewed and be replaced with a system that does meet the airflow requirements as well as be provided with adequate make-up air.

It was observed that the student fume hood assemblies are constructed of plywood.

The metal exhaust duct taps the horizontal ‘duct’ made out of plywood. The cabinets were reportedly made at a shop on campus.

The inlets in the hoods are small but it was also observed, in several places, that the plywood top was warping causing significant ‘horizontal duct’ leakage upstream of the fume hoods.

Sheetmetal does not extend to the hood locations, just unsealed plywood cabinetry.

It is recommended that the student fume hoods be manufactured assemblies that are specifically designed and tested for the application needed to avoid liabilities and provide the required performance.

2.1.23 AAON Units

AAON units were installed outside of the building for additional make-up air to the fume hoods due to the building still remaining in a negative pressure condition. Record drawings do not appear to exist for this work and the work was reportedly not completed to date.

2.2 PLUMBING SYSTEMS

2.2.1 Roof Drainage

The primary roof drainage system seems adequate with water standing only where the roof slope is inadequate for drainage. The secondary roof drainage (or emergency overflow drains) is handled by roof scuppers installed at the base of the roof perimeter parapet wall. There is no secondary roof drainage in the central part of the roof. The roof drains also serve as condensate disposal drains for the roof-top HVAC units. The roof drains are cast iron body with cast iron strainer domes and seem to be in good condition. The above ground roof drainage piping is cast iron with the horizontal piping insulated to reduce condensation drips. It is believed that the below grade piping is also cast iron which is consistent with the Office of State Construction (OSC) standards of the time. The storm drainage building sewer exits the building at several places on the south-west corner.

2.2.2 Domestic Water

According to the existing drawings, the domestic water is supplied from the main in Craver Road. The domestic water enters the building in the ground floor main mechanical room. The domestic water supply is only equipped with a check valve for cross connection protection. This does not meet current cross connection standards and should have the check valve replaced by the required reduced pressure zone backflow preventer assembly (RPZ).

It is reported and also observed that the water pressure, especially on the 2nd floor, is low and in some cases provide inadequate flow. Pressure is currently sufficient enough for the existing flush valves to operate. This may not be true if the existing fixtures are replaced with high efficiency fixtures which require a higher operating pressure. When an RPZ is installed, this will further exasperate the pressure situation and will most likely require a booster pump system to remedy the low pressure problem.

The domestic water is distributed throughout the building with type L copper tubing with soldered joints. It is neither known what type of solder was used nor its lead content. The domestic water piping, both hot and cold, is insulated with fiberglass insulation with all service jacketing (ASJ). The domestic water piping is distributed above the ceiling with drops through the ceiling to the lab benches. In the Teaching Labs, each lab bench has a single cold water drop which is equipped with a two-piece ball valve accessible at floor level. Teaching Lab sinks are only supplied with cold water. Research Lab sinks are supplied with cold and hot water. Each of these drops is equipped with a two-piece ball valve accessible at floor level. Hoods are also supplied with cold water with a single drop serving two hoods.

2.2.2.1 Water Heaters

There are two gas fired water heaters located in the first floor main mechanical room. The water heaters are both A. O. Smith model BTP(V)-740A. The currently installed hot water heater system is inoperative due to what is believed to be issues with a combined flue and combustion air vent. The flues of the two water heaters are combined with the flue of the small steam boiler, located adjacent to the water heaters, and the common flue is routed through a draft inducing fan and then routed outside the building up to the roof. The flues for all three pieces of equipment are constructed of stainless steel. Installation manual for the water heaters does not recommend this type of flue arrangement. The installation manual for the water heater burner recommends a maximum equivalent duct length of 75 ft for the combustion air intake duct directly connected to the burner. The combustion air duct as it is installed has an equivalent duct length of 145 ft.

2.2.2.2 De-ionized Water

There is a de-ionized (DI) water system located in the first floor main mechanical room that serves only the research labs. The DI system is a non-circulating type and only delivers water from a local pump which also circulates water only in the tank. Standard DI water distribution systems are designed as a continuous loop with a circulating pump that maintains constant flow through the loop. The standard design also requires dead end branches be no longer than two feet assuring the system with be continually refreshed. It is not known to what level of polished water is required for the existing or future research labs or if the current non-circulating system is adequate.

DI water is distributed to research areas with polypropylene (PP) high purity piping joined by socket fusing or mechanical joints. The drop to the sink is equipped with a polypropylene ball valve accessible from the floor. DI water piping does not require insulation. The PP piping is supported by a continuous plastic pipe vee shaped support channel on trapeze hangers or vee bottom clevis hangers.

Faucets for DI water at the lab sinks are not high purity type.

2.2.3 Sanitary Waste

The sanitary drainage system collects waste from the toilet room. Due to limited areas of application, access to verify piping material could not be made. State Construction Office standards at the time required sanitary waste to be hub and spigot service weight cast iron, although some no-hub piping was observed in the mechanical room.

2.2.4 Acid Waste

The acid waste, while provided with acid waste piping at the user level, it combines with the general sanitary sewer without acid neutralization when it leaves the building. Existing drawings indicate that the sanitary waste combines with the acid waste and exits the building on the south-west side of the building. The acid waste piping material is borosilicate glass and is joined with compression band couplings. The same is true for the vent piping. It is not known if the acid waste piping is the same glass material installed under slab and underground as the existing drawings indicate. There is reportedly an acid waste disposal policy in place at UNCC that prevents acid waste from being dumped down the drain.

For the Teaching Lab bench sinks, back to back sinks are served by a single acid waste drop through the floor slab. The acid waste drains are collected above the 1st floor ceiling and routed to various drop points to drop below the first floor slab. The sanitary waste piping connects to the acid waste piping below the 1st floor slab.

2.2.5 Natural Gas

There are two natural gas (NG) services for the building; one serves the labs, and the other serves the water heaters and a small steam boiler. The gas service that serves the water heaters and boiler operates at 2 psig and is reduced in pressure at the appliance. The natural gas pressure reducing valve is located in front of the outside air intakes that serve the main air handler of the building. The valve must be venting heavily at times as gas was smelled at the time of the site survey. The valve discharge should be vented up to above the roof level.

The NG piping is welded or threaded schedule 40 black steel. The NG piping for the labs is routed above the ceiling. In both the Teaching Labs and the Research Labs, there is a single ½" NG drop at each lab bench. The drops are equipped with plug valves accessible at floor level. Hoods are also served by an ½" NG drop, with each drop serving two hoods.

2.2.6 Emergency Fixtures

Each of the lab areas is equipped with combination emergency shower/eye wash stations. The eye wash drains are connected to the acid drain system. There are no floor drains in the vicinity of the emergency shower. The emergency shower/eye wash is supplied from the domestic cold water system. The latest edition of ANSI Z358.1 requires that emergency fixtures be supplied with tepid water (65oF-95oF).

2.3 FIRE SUPPRESSION

2.3.1 Sprinklers

Building is currently not equipped with any automatic fire suppression systems. NFPA 45 "Standard on Fire Protection for Laboratories Using Chemicals" classifies this building as a Class C laboratory and requires sprinkler protection and further recommends that hose standpipes be provided. NFPA 45 recommends a level of sprinkler protection for a Class C lab of Ordinary Hazard Group 1 (OH1) with a sprinkler density of 0.15 gpm/sf over hydraulically most remote 1500 sf. Quick response type sprinkler heads are also recommended.

If any renovations are to be made to this building, sprinklers will be required and the case for a fire pump will need to be reviewed.

2.3.2 Fire Extinguishers

Building is currently equipped throughout with portable ABC fire extinguishers. Several type D fire extinguishers were seen located in the corridors.

2.4 ELECTRICAL SYSTEMS

2.4.1 Main Normal Power Distribution

The normal electrical system for this building has three (3) pad mounted electrical service transformers mounted in the blocked in utility yard at the back of the building that are fed from a S&C PMH-12 medium voltage pad mounted switch (#S42C-A) mounted adjacent in the parking lot. The three transformer primaries are fed individually underground into the utility yard by 3-350 KCML (15kV) phase conductors and 1-#2/0 ground conductor in 4" raceways. The three transformer sizes are as follows:

1 – 1000kVA, 7200/12470V PRI, 277/480V SEC – Feeds to SBA switch board 1600A Main Breaker w/GFCI

1 – 750kVA, 7200/12470V PRI, 120/208V SEC – Feeds to SBB switch board 2500A Main Breaker w/GFCI

1 – 750kVA, 7200/12470V PRI, 120/208V SEC – Feeds to SBC switch board 2500A Main Breaker w/GFCI

The service entrance mains (SBA, SBB, and SBC) appeared to be original installation and are approximately 30 years old. This switch gear was observed to be in fair condition but obsolete. No test data/inspection data or testing/inspection documentation was available at the time of this observation. No arc flash labeling was observed on the switchgear (which is required by NFPA 70E). No surge protection exists on any of the main switch gear.

Switch board "SBA" primarily serves the buildings mechanical equipment and lighting loads at 480/277 volts while switch boards "SBB" and "SBC" serve the buildings general purpose loads such as plugs and receptacles on the 1st and 2nd floors at 208/120 volts. No load data was available at the time of this observation, but only minimal or no space (breaker space) was available for additions or modifications.

2.4.2 Internal Power Distribution

Distribution is done throughout the building at the required voltage for the services from the main switch board to circuit breaker panel boards located with-in the building in corridors and laboratories for general purpose loads and a motor control center and panel boards in the ground floor utility space for the utility loads. Feeder conductors and branch circuit cabling appeared to be copper and at a minimum ran in EMT raceways. The majority of the branch circuit panels appeared to be filled to capacity with little or no space available for additions or modifications. Load readings were not available at the time of this observation for individual panel boards. Most of the branch circuit panels appeared to be the original installation and are approximately 30 years old and were observed to be in fair condition but obsolete. Some of the branch circuit panels were installed adjacent to emergency water showers. The branch circuit panels, motor control center, and distribution equipment did not have arc flash labeling (which is required by NFPA 70E) or surge protection installed.

2.4.3 Lighting

Lighting with-in the building was achieved with various fixture types. In the corridors and seated class rooms 2'X4' fluorescent lay-in ceiling troffers were used with T12 & T8 lamps. In the laboratories, with and without ceilings, and in utility spaces, industrial type suspended fixtures were used with T12 & T8 lamps. Lighting with-in the class room labs need to be replaced, also the T12 fixutres need to be replace for energy savings. Egress lighting was installed in the corridors and LED exit signs which were connected to the emergency generator via the life safety branch. Outdoor lighting was achieved by newly installed street light poles and under the eaves and over hangs of this building have can type fluorescents were used.

2.4.4 Emergency Power

A small emergency generator is installed for this building in the utility yard, with-in a metal shed enclosure, which supplies the life safety branch circuits for loads such as egress lighting throughout the building and the fire alarm system. The emergency generator is a ECCO 15kW, 277/480 volt diesel generator with an approximate 55gal fuel storage tank above ground. This storage tank is not a duel wall type unit and has no containment dike for spills. The existing drawings from 1983 indicate a below ground storage tank for fuel but we could not find any evidence that this below ground tank existed. This generator feeds a 100 amp 3-pole automatic transfer switch via a 90 amp circuit breaker on the generator. The load side of the transfer switch feeds the emergency distribution panels. There appear to be non-life safety loads connected to these panels which should be investigated and removed. The national electrical code does not permit non-life safety loads to be connected to this generator without proper separation. There was no load data or test data available at the time of this review. This generator appeared to be the original installation and is approximately 30 years old and was observed to be in fair condition but obsolete. A review of the buildings documents indicated a design for the installation of a new larger generator with multiple branches in 2008 by Elm engineering but no evidence could be found of this design being installed.

2.4.5 Fire Alarm System

The fire alarm system is a Simplex 4020 zoned type installation. The fire alarm control panel (FACP) is located in the mechanical room on the first floor. A remote annunciator is located at the main entrance on the second floor of the building which is at street level. Notification devices (strobes and horns) are located in the corridors; smoke detectors were also in the corridors. Heat detectors are installed throughout the laboratory spaces. This system is relatively new and in fair condition.

2.4.6 Miscellaneous

The drawings indicate that the building was constructed with a ground ring (counterpoise system) encircling the building. There is no structural lightning protection observed on the building roof. There were no surge protection devices observed anywhere in the building.

END OF REPORT