Brush Architects

FEASIBILITY REPORT
MODERNIZATION RECOMMENDATIONS

The Astronomical Observatory Building
University of Illinois Urbana Champaign
901 S. Matthews
Urbana, Illinois, 61801

Submission Date June 30, 2015

By
Mary B. Brush, AIA
Brush Architects, LLC
4200 N. Francisco
Chicago, Illinois, 60618

For
Anthony M. Battaglia
Architect, Capital Planner
University of Illinois at Urbana-Champaign
Facilities & Services, Capital Programs Division, Project Planning
Physical Plant Service Building, MC-800
1501 South Oak Street, Room 115G
Champaign, Illinois 61820

University of Illinois Urbana-Champaign Project Number U14117

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Cost Estimate to be sent under a separate cover

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THE MODERNIZATION STUDY

The purpose of the Modernization Study:

A. The goals of the project
   1. Feasibility study previously submitted
      a) Existing Conditions report
      b) Historical document review
      c) User Group interviews
   2. Modernization Study
      a) Propose options for consideration
      b) Estimated construction cost

3 options for consideration:

Option 1 Summary

1. Priorities for code and life safety improvements
   a) Maintaining the current departments within the building
   b) Maintaining the current building volume
   c) Restoring the building envelope - roofs and walls
   d) Remove hazardous materials, primarily in the basement
   e) Improving the Astronomy department spaces to achieve code compliance and current space needs
   f) Improve ADA for interior and exterior
   g) Improve mechanical electrical plumbing, FP and a/c systems in the original and 1956 building
   h) Improve mechanical, FP and a/c systems in the 1965 addition
2. Design priorities based upon User group interests
   a) creating an opportunity for shared 40 person conference space for all departments to share
   b) create a small museum gallery space for Friends of the Observatory
   c) Astronomy department improvements
      (1) bathrooms
      (2) 40 person class/gallery/meeting room
      (3) zoned heating to allow tempered storage to primary back yard
      (4) new entry stoops south and east
      (5) new ada ramp east
      (6) new ada exterior lift access to first floor and to roof
      (7) new roof deck for astronomy department
      (8) landscaped back yard for socializing with strategic security plantings at window areas

Option 2 Summary

1. Expand Astronomy Department spaces within the building massing
   a) Items of Option 1 of the above and…
   b) Relocate Office for the Vice Chancellor for Research departments
   c) Maintaining the current building volume

d) Improving the Astronomy department spaces to achieve code compliance and current space needs
e) creating an opportunity for allied departments to share the 40 person conference room
f) Astronomy department improvements
   (1) bathrooms
   (2) kitchen
   (3) open research / study areas
   (4) classroom
   (5) office spaces

Option 3 Summary

1. Expand Astronomy Department spaces with a building addition
   a) Items of Option 2 and…
   b) Expand upon the current building volume
   c) New addition includes
      (1) lower level offices
      (2) lower level shared space 'break out' spaces
      (3) storage
      (4) bathrooms
      (5) access to the lower level of the original building
      (6) first floor research library
      (7) first floor offices or classroom
      (8) primary access (ADA) to the building
      (9) new stairwell to lower level

Methodology of Design

The design evolved from addressing the priorities of the base building and combining those priorities with those of the users of the building. The users consist of two distinct groups, The Astronomy Department and the Office for the Vice Chancellor for Research. Each of the groups has subsets as follows:

Astronomy Department (Astronomy)
The Astronomy Department
Friend of the Observatory
Astronomy Alumni

Office for the Vice Chancellor for Research (OVCR)
Division of Animal Resources
Office for Proposal Development Departments

The following assumptions were made in developing the designs:

1. The modernization designs are schematic at this point. It is a space planning and overall priority exercise, but minutia of the design is to be resolved at this point.
2. The departments are referenced by their leadership of Astronomy or OVCR.
3. Recommended room usage at this point is considered to be 'fluid' . When we assign a room to museum, for example, that is our best assumption at the current time. It but presents our opinion that given the current knowledge of the spaces and user intentions, that this is the most logical per our understanding.
4. It is assumed that continued discussions will assess true needs and priorities based on current and future anticipated uses as well as capital campaign allowances for funding available for construction.
5. Please refer to the graphic representation of the floor plans and elevations for clarity of the written description of recommended changes.
6. Structural assessment is summarized within this document as the report by The Structural Group is included in an appendix
7. Mechanical, Electrical, Plumbing, and Fire Prevention is summarized within this document as the report by Architectural Consulting Engineers is included in an appendix
8. It is assumed that this document will be used as a planning tool in conjunction with the Feasibility Report, User Group Report, and Historical Documentation report.
9. All recommendations take into account that the Astronomical Observatory is listed on the National Register of Historic Places and all design modifications to the building exterior and interior will be in accordance with the Secretary of the Interior Standards for Rehabilitation, restoration, and Preservation design.
10. As the historical connection to the building of a specific user driven design, the Astronomy department was considered to have more of a valued connection to the building than OVCR, despite the fact that OVCR has invested in recent improvements in the office space of the building. If the Astronomy department is to grow to a level to achieve the needs of Option 3, the addition, their addition should be on their Observatory, rather than on another building on campus.

Option 1

Architecture

Building Envelope concerns are a high priority due to current water and air infiltration.

Base building immediate repairs - Exterior

Roof

The roofs throughout the building are to be removed and replaced.

The low slope roofs can be insulated, and for the feasibility cost estimate, we are assuming a Single ply Sika type membrane with R30 insulation, Densdeck cover board, base sheet

Replacement of all gutters and downspouts

Masonry repairs at all gutter locations and behind all downspouts

The dome does not require insulation as it is an untempered space by design within the observatory.. Re-clad with metal panels, shingle lap. Zinc clad Copper or Anodized aluminum to match original white color

Palletized roof deck on the south side of the building

Deck rail to match original documents

Masonry

The masonry joints require limited areas of repair and reconstruction. Due to the very narrow profile of the mortar joints between the roman bricks, it was not determined to be necessary to grind and tuck point 100%.

Assume 500 SF exterior wythe reconstruction

30 locations of multi wythe reconstruction 2'-0" x 5'-0" at window and ac unit openings

See ADA Ramp notes

New south entry stoop to be integrated with the exterior lift

Windows

The windows have been substantially modified over the years. Some of the frames are original narrow profile wood frame single glazed windows. Replacements have been sympathetic to the original character. At this time replacement is a low priority, but repair and maintenance is recommended.

Replacement of the ADA door opening with a new window and masonry infill to match

ADA Ramp

Removal of the ADA ramp

landscaping improvements in this area

Construction of the new ADA ramp on the West elevation

New door

Construction of a new exterior lift on the south side of the building to the new first floor stoop and to extend to the roof

Structural (see structural outline)

Structural improvements to the roof for the new roof deck

New beams to allow opening of room 124

New stoop on the south elevation

New ADA ramp on the west elevation

MEP

All MEP / FP concerns as listed in the MEP / FP section of the feasibility report included herein.

Interior Improvements

Rooms C35, 24B, and the Observatory rooms are considered to be the most historic interiors and are to be restored to their original finishes with modifications for code compliance

All other rooms are to receive code compliant MEP/FP, new drywall, paint, ceilings, restored wood floors, new electrical power, lighting and AV equipment as appropriate for the uses, bathrooms to receive tile on floors and walls and new bathroom fixtures.

Abatement

Removal of all asbestos in the building, primarily isolated in the basement

Primary Changes listed by Room

Basement	Overal Abatement and MEP / FP upgrades
Room 27	removal of partitions, transition to kitchen
Room 28, 28A	removal of partition walls, transition of open shared office space
Room 24	storage
First floor	
Rooms 102-118	No Change
Rooms 119-121	Removal of the demising wall, opening of the window to 123 installation of sliding glass doors for the museum restoration of the windows to full operation of top sash installation of skylight 'roof hatches'
Room 123	restoration of the room and the astronomical clock
Room 124A	Transition to the women and the ADA /Unisex bathrooms
Room 124	Climate isolated room for equipment storage Structural modifications for roof deck
124 door	new larger code compliant stoop integrated with exterior ADA lift to roof
Room 127-128	Combined for Mens bathroom
Rooms 128,129,131,132	Combined for new multi-purpose room - new beam required Virtual reality teaching classroom for Astronomy, A gallery space for Friends of the Observatory shared conference meeting rooms for Astronomy and OVCR
132 door	New primary entry to the building with stairs and ADA ramp
Second floor	
Roof above 124	New roof deck
Exterior	
Landscape	South yard to be transformed into Garden /Back Yard with accessible paths from west side to the ADA lift and to the exterior telescope pods Defensive plantings at window locations for security concerns

Option 2

All of Option 1 with the addition of:

Architecture

Substantial interior modifications in the 1965 addition which requires relocation of OVCR.

First floor

Rooms 102-118	Removal of all non load bearing non plumbing walls to create a research library and gallery serving the Astronomy Department Offices for research and management of the library spaces Basement office can remain as is or be modified for more equipment and research storage

Basement

	limited modifications for use as office space
Structure	removal of non load bearing walls in 1965 addition

Option 3

All of Option 2 with the addition of:

Architecture, Structural, and MEP/FP modifications

The new addition to the west side of the building is situated to step back from the original building proportions, allowing for the northernmost window on the west side to be restored. The rounded profile is to graciously interact with the rounded dome of Foellinger Auditorium and to welcome pedestrians around the building to the back yard.

The addition consists of a basement with offices and a first floor with classroom and reception areas will be located adjacent to the west elevation of the existing building. The addition structure can be either a continuation of the current structure type in wood framing or a non-combustible construction in concrete slab and steel. It is assumed that the walls will be brick masonry to match the existing and the windows will also match the historic where double hung, and a more contemporary glass storefront will create the rounded portion of the building. The roof will be covered with a low slope insulated membrane integrated with the primary building system.

First floor	
Addition	Astronomy reception, informal meeting spaces, bathroom
	movable wall partitions to create up to 2 classrooms
	direct access to exterior rear yard
	access to the multi purpose room created in option 1
	Stairway down to basement/lower level
Basement	
Addition	Basement/ lower level connection to room 28 offices
	second means of egress from basement
	research offices/ storage

The Structural Group, Ltd.
707 Lake Cook Road, Suite 107, Deerfield, Illinois 60015 Phone 847.562.1977 Fax 847.562.1978

OUTLINE SPECIFICATION

Project:	UIUC Astronomical Observatory Urbana, Illinois
TSG Project No.:	14BAL02
Date:	June 4, 2015

This Outline Specification is based on drawings prepared by Brush Architects, LLC (BAL) and received by The Structural Group, Ltd. (TSG) as follows:

Preliminary Basement Floor Plan - Phase 1	May 13, 2015
Preliminary First Floor Plan - Phase 1	May 13, 2015
Preliminary Roof Plan - Phase 1	May 13, 2015
Preliminary First Floor Plan - Phase 2	May 13, 2015
Preliminary Basement Plan - Phase 3	May 13, 2015
Preliminary First Floor Plan - Phase 3	May 13, 2015
Preliminary North & West Elevations - Phase 1 & 2	May 13, 2015
Preliminary South & East & Partial East & West Elevations - Phase 1 & 2	May 13, 2015
Preliminary South & Partial East Elevations - Phase 3	May 13, 2015
Preliminary South & Partial East Elevations - Phase 3	May 13, 2015

The information in this Outline Specification is to be used in conjunction with the architectural drawings indicated above.

Outline Specifications for UIUC Astronomical Observatory
Urbana, Illinois
TSG P.N.: 14BAL02
June 3, 2015

Structural Schemes:

I. Phase 1

A. **New Stair and ADA Ramp at Existing West Elevation** - New ADA ramp located at west elevation of existing building will consist of exterior cantilever masonry walls supported on continuous cast-in-place concrete frost walls and footings. The ramp will consist of concrete slab on grade that slopes per architectural requirements. New concrete stairs will lead up to a landing at the entrance on existing west elevation.

B. **New Multi-Purpose Room within Existing West Classroom** - Existing masonry wall between original building and north side of 1956 addition will be removed to provide one open space. Presumed posts supporting roof girders will need to be removed. New steel beams and column with footing will be provided to support the existing roof girders at the 1956 addition and possible roof framing of the original building. The orientation of the roof framing will need to be confirmed.

C. **New Stair and Porch at Existing South Elevation** - New stair and porch located at south elevation of existing building will consist of exterior cantilever masonry walls supported on cast-in-place concrete frost walls and footings with concrete slab on grade.

D. **New Roof Top Deck and Area of Assisted Rescue** - New roof top deck and area of assisted rescue will be added above the existing roof on the south side of the original building. The new roof top deck will consist of wood (or composite) decking on treated dimensional lumber floor joists spaced at 16" o.c. spanning to beams consisting of engineered wood lumber supported by wood posts. The wood posts will be supported by the existing exterior masonry walls of the original building. The area of assisted rescue will consist of wood joists and beams supported by wood posts that go down to the new masonry walls at the porch.

II. Phase 2 (In Addition to Phase 1)

A. **Removal of First Floor Non Load Bearing Walls in 1965 Addition** - Per the existing drawings, the interior walls along both sides of the 1st floor corridor support the existing roof framing above. Where the existing corridor walls are removed, the existing wood roof framing will need to be supported by new steel beams that span to new steel columns that extend down to new cast-in-place concrete footings below the existing basement slab on grade.

III. Phase 3 (In Addition to Phase 1 and 2)

A. **New Addition Adjacent to Existing West Elevation** - A new addition consisting of a basement with offices and a first floor with classroom and reception areas will be located adjacent to the west elevation of the existing building. The addition structure can be either a continuation of the current structure type in wood framing or a non-combustible construction in concrete slab and steel. It is assumed that the walls will be brick masonry to match the existing and the windows will also match the historic where double hung, and a more contemporary glass storefront will create the rounded portion of the building.

1. Wood Construction -

a. The first floor framing will consist of plywood sheathing on dimensional lumber floor joists spaced at 16" o.c. spanning from steel girders and columns at the corridor to exterior cast-in-place concrete basement walls supported on continuous concrete footings.

b. It may be possible to consider open web wood floor trusses for ease of utility runs.

c. The roof framing above the classroom will consist of metal plate connected wood trusses spanning to exterior masonry walls supported on the basement walls below. The roof framing above the reception area will consist of metal plate connected wood trusses spanning to exterior structural steel beams and columns along the curved facade and the existing masonry wall on the west elevation of the existing building.

2. Non-Combustible

a. The first floor framing will consist of concrete on steel deck on open web steel joists spanning from steel girders and columns at the corridor to exterior cast-in-place concrete basement walls supported on continuous concrete footings.

b. The roof framing above the classroom will consist of wide rib steel roof deck supported on open web steel joists spaced between 5 to 6 feet o.c. spanning to exterior masonry walls supported on the basement walls below. The roof framing above the reception area will consist of wide rib steel roof deck supported on open web steel joists spaced between 5 to 6 feet o.c. spanning to exterior structural steel beams and columns along the curved facade and the existing masonry wall on the west elevation of the

existing building.

3. In both schemes existing foundations below existing masonry walls will need to be investigated for additional load. Lateral resistance will be provided by masonry shear walls on the west, south, and east elevations and a moment frame along the north elevation.

June 19, 2015

UIUC Observatory MEPFP Assessment and Feasibility Study

General:

Architectural Consulting Engineers (ACE) visited this building on Tuesday, January 13, 2015 and Wednesday, January 14, 2015. We were able to access all spaces for review except the IT/data closets. We were also unable to access the majority of electric distribution panels although we could access the main switchboard room and there were a few unlocked panel doors so we could get a sense of the age and condition of the electrical distribution panels.

As part of this facility review, we have been provided drawing files for the building and various additions through the years. We have reviewed these drawings to help us better understand what changes have been made to the building and the building systems throughout the years. Based on the current building configuration it is apparent that we do not have all the drawings related to the building renovations, but it seems the majority of major changes are represented with the exception of:

- Changes to the 1965 building addition that removed the central air conditioning system.
- Recent changes to the 1965 building addition that seem to primarily be cosmetic.
- An IT/Data project that appears to be incomplete or on-going.

Mechanical System Observations:

- The entire building is heated with campus steam through a perimeter heating system – cast iron radiators in the older buildings and convectors and cabinet heaters in the newer building.
- Campus steam currently enters the building in the ground floor level of the east building, Room 17. This room also houses the main electrical service transformer & switchboard, condensate return connection, and basic control system for the steam heat zones.
- A vacuum pump collection system is located in a deep pit in Room 20 where it collects steam condensate from the building radiant system and sends it back to the district condensate return connection in Room 17.
- There appear to currently be three heating zones – each with a zone control valve in Room 17: 1965 building east, 1965 building west, and the older building areas.
    - Each radiator and convector has an individual shut-off valve and steam trap.
    - The radiators serving the original 1896 building and 1956 addition classroom and office areas have been isolated at the shutoff valve although there is live steam up to the valve.
        - Leaving a room unconditioned in this way may have consequences for the building envelope.
    - We noted on the original 1965 drawing files that each room/office in the 1965 building had a thermostat which controlled steam to the convector in that space.

Architectural Consulting Engineers
837 Hayes Avenue
Oak Park, Illinois, 60302
Phone: (708) 524-0272
Email: menussbaum@comcast.net
Web: www.ace-oakpark.com

- This extensive zoning seems to have been removed in favor of bulk zoning of larger areas – although we have no drawings that indicate when that work was done.
- There is a relay based control system in the mechanical room that may have time of day control, but the details of the control sequences were not immediately available.
- There were anecdotal complaints of poor heat control in the individual offices with some people noting extremely high temperatures in their rooms especially after weekends when their rooms have been isolated with shut doors.
    - In some cases people noted they had to turn on the air conditioning unit in the winter due to this overheating condition.
    - It would be possible with the current installation to improve this situation through manual operation of the shut off valve but these valves are not conveniently located and are not clearly marked for this use. One of the downsides to this manual control would be poor control of the space temperature as occupancy and outside conditions changed.
- In addition to the anecdotal information, one occupant actually provided data logger information for our use. Ms. Tonja Marie Henze uses data loggers that measure temperature and humidity as part of her job and she noted that loggers sitting on her desk over a weekend recorded the local data. During this process she noted excessively high temperatures over a winter holiday weekend.
    - She has provided a data set from January 30, 2015 through February 5, 2015. This data shows a high temperature of about $87°F$ just before midnight on January 31, 2015.
    - She reported that her office door was closed and as it turns out, her office door transfer grille is actually covered over so there is no significant movement of air between her office and the corridor when her door is closed.

- Air conditioning is generally provided for each isolatable space with a through-the-wall or window type air conditioner unit.
    - Some of these units appeared to be in significant disrepair.
    - We noted in the 1956 addition and on the original 1896 building that provisions were made in many of the rooms for these local room air conditioners.
    - We noted in the 1965 building addition drawings that there was a central air conditioning and ventilation system that provided cooling air to all offices. This air was provided by ground floor interior mounted air handlers in what are now Rooms 18 & 19. The units were zoned to provide east/west zoning with ducts mounted at the hallway ceiling and air delivered above the door. Return air was central in the corridor with individual door grilles for return from the space.
        - This system seems to have been removed although we have no drawings that indicate when that work was done nor do we know what the circumstances were that led to the removal of this central air handling system.

    - There was a small Computer Room style condensing unit (Liebert) located in the courtyard area on the south side of the building. We did not see the corresponding interior unit so we assume this interior unit serves the IT/data room we were not able to access in our field survey.
- Outside air ventilation for the building is currently handled with natural ventilation by means of manual operation of operable windows. This is not uncommon in buildings that have radiant heating as there is no mechanism for delivering tempered outside air. The downside of natural ventilation is that windows are rarely opened in severe weather conditions leaving the spaces effectively unventilated much of the time.
    - We noted in the 1965 building addition drawings that there was a central air conditioning and ventilation system that provided cooling air to all offices. This air was provided by ground floor interior mounted air handlers in what are now Rooms 18 & 19. The units were zoned to provide east/west zoning with ducts mounted at the hallway ceiling and air delivered above the door. Return air was central in the corridor with individual door grilles for return from the space.
        - This system was designed to provide forced air ventilation to all occupied spaces in the 1965 addition.
        - This system seems to have been removed although we have no drawings that indicate when that work was done nor do we know what the circumstances were that led to the removal of this central air handling system.
- Exhaust air for spaces such as toilet rooms and janitor closets is provided by means of exhaust fans, either local or roof mounted ventilators.

Mechanical System Recommendations:

There are different levels of improvement that can be made to the environmental systems at this building, depending on the final programming of the spaces and improvements to the existing building envelope and any additions. If we are looking to add new mechanical systems we generally recommend that this be preceded or in conjunction with envelope improvements so that smaller more efficient systems can be used. It is our understanding that basic envelope improvements would likely include new roof insulation and new windows. Of course any new addition would have to comply with the State of Illinois Energy Code, so this new work would already be of a highly efficient design.

The proposed HVAC solutions range from improvements to the current operating and control of the existing systems in place to enhance the occupant comfort to full systems replacement in order to provide the most efficient and comprehensive improvements to the building for comfort and energy consumption. The recommendations are as follows:

1. **Basic Improvements:** Includes basic changes to existing systems to improve operation and comfort.
    a. Unless there is a programmatic reason for isolating the radiators in the 1896 portion of the building, we would recommend these radiators valves be opened to help keep the proper temperature in the space. If repairs are needed then this work should be done whenever possible so these systems can be activated.

b. Since the building currently uses a zoned, perimeter steam heating system, the most cost effective method to improve individual space comfort if to replace the manual radiator/convector isolation valves with a thermostatic control valve. This effectively makes every radiator a controlled zone without the need for electrical control components and can greatly reduce the issue of overheating in spaces.
    i. These thermostatic valves are easily installed and can be configured with the sensor/control - valve mounted or remote mounted depending on the specifics of the terminal equipment.
    ii. They limit overheating situations by closing the control valve when space set point is reached.
    iii. They will open when the space is below set point but they do not cause the system zone valve to operate open if the system set point is reached. This operational limitation can be overcome by placing the system controlling thermostat in the worst case location so that steam is available whenever it is likely that a zone would call for heat.
    iv. They can be installed on the cast iron radiators as well as the fin tube convectors although whenever the valve is concealed as is the case in the convectors, the sensor/controller portion must be remotely mounted to allow for user interface and proper sensing of space temperature.
    v. This solution does not need to be universally applied but could be applied only in the worst case spaces of overheating as a means of addressing this overheating issue. Manual control of the remaining radiators/convectors could remain and in this case, no relocation of the main zone control thermostat would be required as we would only be addressing over heated spaces.
    vi. There are some models that feature a battery powered control head that provides for set back control of the valve controller – which can add additional savings opportunity for reduction of space set point at night and over weekends.
    vii. An alternative to the stand alone thermostatic radiator control valve is to reintroduce an electrically operated valve with associated thermostat. This solution would be significantly more costly to implement but is a more robust solution.

c. Local air conditioning units should be maintained and/or replaced as required so that local air conditioning is available. Newer models of this style A/C are reasonably efficient and they can be configured with setback control so they do not operate off hours, thus providing for more efficient electrical consumption.

d. Operable windows should remain and should be maintained so that local ventilation is available in all occupied spaces to meet code requirements.

2. **Enhanced Improvements:** Includes systemic improvements or system replacement to achieve a higher level of operational control and efficiency.
    a. In the east portion of the building, it would be relatively easy to reinstall a central style HVAC system similar to the system installed and removed.
        i. The original space vacated from the original mechanical system could be taken back and a new central air handling system could be installed to serve main ducts

routed at the ceiling of the corridors with supplies to each room above the doors. A remote condensing unit would be required or chilled water from some other source (locally produced or central campus distribution). Heating would be provided by the existing steam system.

1. In lieu of interior air handlers, rooftop style HVAC units could be installed which would eliminate the need for the remote condensing unit or chilled water source. We realize that rooftop air conditioners are typically not a desirable long term solution, but given the current lack of interior space to locate an air handling system, this might be preferred to vacating office space.

ii. In lieu of the door grilles we would recommend that a ducted return system be established which will provide for better system performance and acoustical control between the spaces and the corridor.

iii. This central air handling system could work in conjunction with the suggested thermostatic radiator valves or upgraded electrically operated radiator control valves by supplying temperature neutral ventilation air in the winter and allowing the steam perimeter system to still provide the local temperature control.

iv. Summer control would typically be by zone which could be at the room level through a damper control system or alternatively by floor or building orientation.

v. Room air conditioners would be removed and the walls patched.

b. In the older portion of the building a couple possible scenarios exist for a central approach.

i. A central air handler could be located in the basement mechanical room 24. This is not a large space but a careful design could allow for this equipment. The most challenging aspect of this type of approach would be finding duct routing through the basement to serve the main floor level. Again the unit would either be served by a remote condensing unit or chilled water and steam as described above in the 1965 system description.

1. Similar to the 1965 building addition, a rooftop unit approach could also be used for this older building which would eliminate the need for the remote condensing unit or chilled water source although either a drop ceiling or soffits would be required to hide the duct runs and any proposed uses for the building roof for observations would be more challenging.

c. Alternative approaches for all or a portion of the building could be considered to eliminate the roof mounted equipment, which may not be desirable from the university standpoint as it is less accessible for maintenance and is not as robust in design and construction as other system choices.

i. The perimeter heating units (cast iron radiators/fin tube convectors) and room air conditioners could be replaced with a local unit ventilator/fan coil unit. For versatility we would recommend adding a steam-to-hot water heat exchanger to provide hot water to all heating units. Cooling could be provided by a variety of methods (see below). Ventilation could be provided within each local unit to

meet the minimum code requirements for the space or through a dedicated outside air unit provided a reasonable location and distribution system can be established.

1. If campus chilled water is located nearby, or a planned extension brings it close enough, a new branch could be brought into the building and a new piping distribution system would be routed to distribute this chilled water to each unit.
2. If campus chilled water is not immediately available or is prohibitively expensive to implement, then a local air cooled chiller sized for the building load, could be installed to serve each of the room terminal units through the new distribution piping. We estimate a chiller with a 40 to 50 ton capacity would be sufficient for the existing building and proposed addition, depending somewhat on the final planned use of the spaces.
3. Condensate piping would need to be added to remove condensation from the cooling process.
4. Electrical abandoned from the local A/C unit demolition could be utilized for the new equipment.
5. A central control system (BAS) would be installed and interconnected with the campus system as required/desired.
6. If chilled water is readily available through the central plant, then this is the most inexpensive system to implement of the chilled water based solutions and eliminates the need for local exterior equipment or a ground loop heat exchanger.

ii. A water source heat pump system could be installed in lieu of the chilled water solution to provide for heat and cooling.

1. This would require installation of an air cooled heat exchanger near the building for cooling mode and a steam to water heat exchanger in the building for heating mode OR installation of a ground loop heat exchanger that would handle both heating and cooling mode.
2. Either scenario would require a piping system to circulate the water to the units for exchange of energy.
3. Steam and condensate piping would be removed from all spaces served by the heat pump unit.
4. Condensate piping would need to be added to remove condensation from the cooling process.
5. Electrical abandoned from the local A/C unit demolition could be utilized for the new equipment.
6. A central control system (BAS) would be installed and interconnected with the campus system as required/desired.
7. If the cost to extend central chilled water is high or prohibitive, then this system would represent the most cost effective solution of the chilled water based solutions although some local equipment would have to be

installed and maintained so there could be an aesthetic or noise issue that would have to be mitigated.

iii. A ground source heat pump system could be installed in lieu of the water source heat pump system or chilled water solution to provide for heat and cooling.

1. This would require installation of a ground loop heat exchanger that would handle both heating and cooling mode.
2. Either scenario would require a piping system to circulate the water to the units for exchange of energy.
3. Steam and condensate piping would be removed from all spaces served by the heat pump unit.
4. Condensate piping would need to be added to remove condensation from the cooling process.
5. Electrical abandoned from the local A/C unit demolition could be utilized for the new equipment.
6. A central control system (BAS) would be installed and interconnected with the campus system as required/desired.
7. This system would be one of the more expensive systems to implement for the chilled water based solutions although it would represent one of the most efficient choices available. There would not be any exterior equipment to locate and maintain nor would there be a need for extending the central chilled water system to the building. Care would have to be taken to locate the compressor driven equipment so that vibration did not impact the observatory equipment.

Electrical System Observations:

- The original electric service for the 1896 building was a 60 amp, two-pole service drop into the Room 24. This service was then fed into a panel located in what is now Room 24A a closet below the stairs from the lower level to the main level of the 1896 building. Knob and tube wiring seemed to emanate out of this panel location to devices in the building.
    - Some of this knob and tube wiring remains although in some cases it appears that modern conductors have replaced the original wiring. This would seem to indicate that the knob and tube wiring may still be operational, all or in part.
    - There is knob and tube wiring that is also visible on the ceiling of the Room 133 below the telescope room that seems to come from this original panel and is routed up into the area where the telescope sits above.
- In the 1956 addition, a new 100 amp service was installed to replace the original 60 amp service. A new panel was installed in Room 28 to support new lighting and equipment and the original 60 amp panel was refed.
- The building is currently served by an incoming 4160 volt primary service which is converted with a transformer to an 800 amp, 120-208 volt, three-phase, four-wire building service, which dates to the building construction (1966).
    - The transformer and main switchboard are located in Room 17 of the 1965 building addition, which also houses the entering district steam service, steam pressure reducing

station and condensate return system. It appears that there originally was a separate room for the service entrance but this wall is not in the current configuration.
    - This project refed the service entrance location in Room 24 with a new underground 100 amp feeder.
- Electrical distribution sub-panels are located throughout the building. These panels were generally locked and not available for review.
- At some point which is unknown, but after the 1965 addition, an additional panel was installed in Room 24 to replace a four-circuit fuse panel from the original construction.
- A modern system for IT data distribution that consists of cable trays, large conduits, surface mounted raceway and device boxes - and is only partially installed. It is unclear when this work was started or if there are plans to complete.
- There was a recent project (date unknown) that addressed the finished surfaces of the 1965 addition. New energy efficient fluorescent lighting seems to have been installed throughout the 1965 building at this time.
- Most areas of the 1896 & 1956 buildings are served by older T12 lamped fluorescent fixtures except for the common corridor areas which have been upgraded to more efficient T8 lamped fixtures.

Electrical System Recommendations:

The majority of this building has electrical distribution components (panel, circuit breakers, conductors & conduits) that are relatively new and of modern construction. These newer components are still serviceable and should continue to provide good service into the future uses of the building, with the following exceptions:

1. Electrical equipment such as circuit breakers and receptacles that have a mechanical component to facilitate their function (spring tension) or components that age out (circuit breaker and receptacle body material) should be replaced periodically to prevent failure. While they may still operate, their continued use past their useful life can present a safety issue.
    a. We would recommend any of these devices or components dating back to the original construction timeframe of 1950's and 1960's, should be replaced with new components of similar style and capacity.
    b. Where projects done in the last 40 years have called for the replacement of these components, then these devices and components of newer construction could remain.

Where any section of the building is served by older wiring systems such as the knob and tube systems noted in portions of the 1896 building, these systems should be replaced with modern conduit based systems. In some cases the knob & tube wiring may want to be retained as inactive historical references but they should be clearly labeled as such.

New wiring changes to support any mechanical or plumbing system changes should be done as required with upgrades to components as needed to bring them into compliance with university and building code requirements.

The lighting systems in the building have largely been upgraded with modern highly efficient lamped

fixtures. This process should continue with the ultimate replacement of all older style lamping and incandescent fixtures throughout the building. This would include exit lights which should generally be replaced with LED style fixtures since they are on continuously. As an added improvement, lighting controls can be added that will use motion sensing devices in utility and storage spaces, for a more efficient operation.

IT/Data systems that have been partially installed should either be completed, or the open boxes and raceways should at a minimum be buttoned up with cover plates so that it is clear the system installation is not a partial work in progress.

Plumbing System Observations:

- The original water service fed the 1896 building from the west side with an underground pipe into Room 24 where it was distributed to the plumbing fixtures. This service was slightly altered in the 1956 addition with the feed pipe elevated above the ceiling of Room 28 and extending over and reconnecting into the service pipe location in Room 24.
    - This water service still appears to be active.
- A new water service was added in the 1965 addition to handle the new plumbing fixtures. This service enters the building at Room 17.
- A 4" sewer went out of the building of the 1896 building on the east side, of the south wing and extended to the main sewer.
    - In the 1965 building addition, this sewer was extended to the east and the new sanitary fixtures were added to the system.
- Storm water seems to be directed to a separate system.
- In 1956 a natural gas service is shown entering the building on the east side of the east wing although it is not clear what this service was used for.
    - There is evidence of gas cock style connectors in Room 24 and in the closets adjacent to the telescope room. These connections are not functional and the piping seems to have been cut at some locations.
- In 1956, Room 28 was added which required a sump pump to be installed to handle plumbing fixtures in this low area. This sump pump handles floor drains and sinks from Room 28 and adjacent Room 27 (Dark Room), as well as sub-soil drain from around this lower basement room. The sump pump sits in the Hall just outside these two rooms.
    - There is a note attached near this sump pump indicating that a previous stuck float switched caused flooding in the lower basement area.
    - Modern plumbing code would require this storm and sanitary sewer be handled by two separate systems – a sewage ejector system and a sump pump system.
- An electric water heater sits next to the sump pump to provide domestic hot water to the plumbing fixtures in the 1896 and 1956 buildings.
- An electric water sits in Room 17 to provide domestic hot water to the plumbing fixtures in the 1965 building.
    - This water heater system also has a circulation pump to help maintain water temperature near the fixtures.

- Domestic water piping throughout the building is galvanized except where recent work has been done. In these locations copper piping is evident. Galvanized piping will tend to degrade over time with corrosion filling the pipes and eventually limiting water flow.
- The restrooms in the 1965 building were recently upgraded with new automatic flush valves.
- The toilet in the 1896 building is an older model manual flush valve.
- Lavatories are all manual operated faucets.

Plumbing System Recommendations:

The sanitary sewer for the building is almost certainly cast iron which has a very long life. This system, short of required changes for renovations etc., should be serviceable well into the future use of the building. Vent piping, which is commonly galvanized steel, does not fare as well due to the moist warm air that is ever present, so it will often corrode and perforate. These systems should be upgraded as required whenever other work is being done that affects the piping.

Domestic water piping in this building is a mixture of galvanized and copper. The older galvanized piping would be very suspect as severe internal corrosion will occur that slowly reduces the effective internal dimension and can also cause leaks. Connections between galvanized and copper piping is also subject to galvanic corrosion unless a di-electric coupling or union is used to disconnect the two materials. The galvanized domestic water piping should generally be replaced with insulated copper piping whenever any project is undertaken that exposes this often concealed piping or where repairs are needed.

The ultimate goal should be to replace all the galvanized vent and domestic water piping throughout the building.

Other plumbing piping such as natural gas or compressed air that has been abandoned through time should be removed in its entirety in order to prevent confusion as to source and function. Should there be any purported historical significance to certain systems, then sections could be maintained but clear documentation should be made so it is clear what is abandoned piping and what is active.

Conclusions:

The building systems with the multiple additions throughout the years is currently operating in an inefficient, and poorly controlled fashion that is challenging to the building envelope in some cases and creates a generally uncomfortable environment for the building occupants through much of the year. Poor heating control, lack of quality conditioned ventilation air, and inefficient or non-existent cooling systems characterize the current HVAC systems. While electrical and lighting systems are in somewhat better condition, there are still aged out system components and inefficient equipment that make for a less than ideal system arrangement. Plumbing systems are still functional but will require on-going maintenance for older system materials.

New proposed uses of the building and proposed additions offer an opportunity to improve the systems and their performance, both in efficiency and occupant comfort. Electrical lighting systems should be upgraded to meet the current energy code and University requirements and plumbing systems should be extended and improved to meet the new programming needs of the renovated building.

UIUC Observatory MEPFP Assessment and Feasibility Study

The biggest challenge lies with how to handle the HVAC system. Some immediate recommendations to help the building occupants manage until other systems are improved or replaced would include adding control to the perimeter heating system and maintaining and replacing window/through-wall air conditioners so they operate. These improvements could greatly help operating costs since there seems to be use of cooling equipment in the winter due to overheating of the spaces.

On the long term agenda, especially if the building addition is moved forward, some form of integrated HVAC system should be installed. This integrated approach would create a controllable, more efficient system that could address the many needs of the current building as well as the proposed addition. Our ranked recommendations are as follows:

1. A chilled water/hot water based system using local fan coil unit ventilators to provide for HVAC individually controlled in each occupied space. A building automation system would provide for efficient control and maintainability.
    a. Steam to hot water heat exchanger as the heat source and campus chilled water as the cooling source.
    b. This could be the most cost effective initial installation depending on where the chilled water has to be brought from but would certainly be the least maintenance intensive as the central plant steam and chilled water are already maintained.
2. A chilled water/hot water based system using local fan coil unit ventilators to provide for HVAC individually controlled in each occupied space. A building automation system would provide for efficient control and maintainability.
    a. A ground-source heat pump based system to create the chilled and hot water with a local reversible chiller and a locally installed ground loop heat exchanger.
    b. This is the most efficient operating system and has the least impact on the local aesthetic and exterior use of the grounds.
3. A chilled water/hot water based system using local fan coil unit ventilators to provide for HVAC individually controlled in each occupied space. A building automation system would provide for efficient control and maintainability.
    a. Steam to hot water heat exchanger as the heat source and local chiller as the cooling source.
    b. This could be the most cost effective initial installation depending on where the chilled water has to be brought from but would have increased maintenance and exterior issues that would have to be dealt with for form and functionality.
4. Interior mounted central air handling equipment using remote condensing units.
    a. This would require vacating some interior spaces and likely duct soffits that would need to be accounted for.
    b. The exterior equipment would have to be dealt with for form and functionality.
    c. Less controllability than the distributed fan coil system.
    d. Less interior maintenance required due to central approach but exterior equipment to maintain.
    e. A chilled water air handling unit is also a possible choice in lieu of the remote condensing units. This approach would have similar benefits and disadvantages as noted above.
5. Roof mounted self-contained air handling equipment (RTU).

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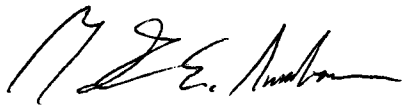
a. This would require vacating some interior spaces and likely duct soffits that would need to be accounted for as well as having roof mounted that would have to be maintained and handled aesthetically.
b. Less controllability than the distributed fan coil system.
c. Less interior maintenance required due to central approach but exterior equipment to maintain.
d. A chilled water air handling unit is also a possible choice in lieu of the remote condensing units. This approach would have similar benefits and disadvantages as noted above.

Respectfully Submitted:
Architectural Consulting Engineers



Mark E. Nussbaum, P.E.

Architectural Consulting Engineers
837 Hayes Avenue
Oak Park, Illinois, 60302

Phone: (708) 524-0272
Email: menussbaum@comcast.net
Web: www.ace-oakpark.com

The Concord Group
Construction Consultants

55 East Monroe Street
Suite 2850
Chicago, IL 60603
312.424.0250 T
312.424.0252 F
www.concord-cc.com

U of I URBANA-CHAMPAIGN
OBSERVATORY RENO & ADDITION

901 S Mathews Ave
Urbana, IL 61801

Feasibility Estimate
July 16, 2015

Prepared For:
Brush Architects, LLC
4200 N. Francisco
Chicago, IL 60618

NOTES REGARDING PREPARATION OF ESTIMATE

This estimate was prepared based on the following documents provided by Brush Architects:

1. Modernization Study dated June 19, 2015.
2. Structural Specification Outline dated June 3, 2015.
3. MEP Assessment and Feasibility Study dated June 19, 2015
4. Information regarding the project was also obtained via meetings, phone conversations, and email messages that clarified the project scope.

BIDDING PROCESS - MARKET CONDITIONS

This document is based on the measurement and pricing of quantities wherever information is provided and/or reasonable assumptions for other work not covered in the drawings or specifications, as stated within this document. Unit rates have been generated from current material/labor rates, historical production data, and discussions with relevant subcontractors and material suppliers. The unit rates reflect current bid costs in the area. All unit rates relevant to subcontractor work include the subcontractors overhead and profit unless otherwise stated.

Pricing reflects probable construction costs obtainable in the Urbana, Illinois area on the bid date This estimate is a determination of fair market value for the construction of this project. It is not a prediction of low bid. Pricing assumes competitive bidding for every portion of the construction work for all subcontractors with a minimum of 3 bidders for all items of subcontracted work and a with a minimum of 3 bidders for a general contractor. Experience indicates that a fewer number of bidders may result in higher bids, conversely an increased number of bidders may result in more competitive bids.

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

ASSUMED CONSTRUCTION PARAMETERS

The pricing is based on the following project parameters:

1. A construction start date of July 2020.
2. The contract will be competitively bid to multiple contractors.
3. All contractors will be required to pay prevailing wages.
4. There are no phasing requirements.
5. The contractors will have full access to the site during normal working hours
6. Estimate includes pricing as of July 2015.

EXCLUSIONS

The following are excluded from the cost of this estimate:

1. Professional Design Fees
2. Testing Fees
3. Owner Contingencies/Scope Changes
4. Construction Contingency
5. Premium Time / Restrictions on Contractor Working Hours
6. Finance and Legal Charges
7. Contaminated Soil Removal
8. Temporary Facilities
9. Loose Furniture (Interior and Exterior)
10. Equipment (Owner Furnished/Installed)
11. Artwork
12. Non-fixed Audio/Visual Equipment
13. Telephone / Data Equipment
14. Intercom System
15. Fire Alarm
16. Communications
17. Security Systems
18. Terrazzo
19. Structural Repair at Dome

COST SUMMARY	BUILDING TOTAL
OPTION 01: RENOVATE 1956 BUILDING	$3,651,937
OPTION 02: RENOVATE 1956 & 1965 BUILDINGS	$4,509,275
OPTION 03: RENOVATE 1956 & 1965 BUILDINGS & NEW ADDITION	$6,460,851

NOTE:
Scope for Options 1, 2 and 3 align with the Scope detailed in the
"Feasibility Report - Modernization Recommendations" dated June 30, 2015

	COST SUMMARY		BUILDING TOTAL
01000	GENERAL REQUIREMENTS		$0
02000	EXISTING CONDITIONS		$70,287
03000	CONCRETE		$0
04000	MASONRY		$320,185
05000	METALS		$47,335
06000	WOODS, PLASTICS & COMPOSITES		$31,748
07000	THERMAL & MOISTURE PROTECTION SYSTEM		$262,997
08000	OPENINGS		$126,944
09000	FINISHES		$266,291
10000	SPECIALTIES		$5,000
11000	EQUIPMENT		$11,497
12000	FURNISHINGS		$155,000
13000	SPECIAL CONSTRUCTION		$35,000
14000	CONVEYING EQUIPMENT		$72,197
21000	FIRE SUPPRESSION		$39,703
22000	PLUMBING		$67,752
23000	HEATING, VENTILATING & AIR CONDITIONING		$343,600
26000	ELECTRICAL		$75,000
27000	COMMUNICATIONS		$0
28000	ELECTRONIC SAFETY AND SECURITY		$0
31000	EARTHWORK		$6,088
32000	EXTERIOR IMPROVEMENTS		$99,193
33000	UTILITIES		$157,368
	SUBTOTAL		**$2,193,184**
	ESCALATION TO MID-POINT OF CONSTRUCTION	21.7%	$474,824
	GENERAL CONDITIONS/BOND/INSURANCE	15.0%	$400,201
	CONTRACTOR'S FEES	3.5%	$107,387
	DESIGN CONTINGENCY	15.0%	$476,340
	TOTAL ESTIMATED CONSTRUCTION COSTS		**$3,651,937**

	COST SUMMARY		BUILDING TOTAL
01000	GENERAL REQUIREMENTS		$0
02000	EXISTING CONDITIONS		$87,199
03000	CONCRETE		$0
04000	MASONRY		$320,185
05000	METALS		$169,500
06000	WOODS, PLASTICS & COMPOSITES		$58,507
07000	THERMAL & MOISTURE PROTECTION SYSTEM		$262,997
08000	OPENINGS		$163,522
09000	FINISHES		$352,040
10000	SPECIALTIES		$8,000
11000	EQUIPMENT		$6,497
12000	FURNISHINGS		$167,400
13000	SPECIAL CONSTRUCTION		$35,000
14000	CONVEYING EQUIPMENT		$72,197
21000	FIRE SUPPRESSION		$49,454
22000	PLUMBING		$72,478
23000	HEATING, VENTILATING & AIR CONDITIONING		$520,437
26000	ELECTRICAL		$100,000
27000	COMMUNICATIONS		$0
28000	ELECTRONIC SAFETY AND SECURITY		$0
31000	EARTHWORK		$6,088
32000	EXTERIOR IMPROVEMENTS		$99,193
33000	UTILITIES		$157,368
	SUBTOTAL		**$2,708,062**
	ESCALATION TO MID-POINT OF CONSTRUCTION	21.7%	$586,295
	GENERAL CONDITIONS/BOND/INSURANCE	15.0%	$494,154
	CONTRACTOR'S FEES	3.5%	$132,598
	DESIGN CONTINGENCY	15.0%	$588,166
	TOTAL ESTIMATED CONSTRUCTION COSTS		**$4,509,275**

	COST SUMMARY	BUILDING TOTAL
01000	GENERAL REQUIREMENTS	$0
02000	EXISTING CONDITIONS	$87,199
03000	CONCRETE	$132,488
04000	MASONRY	$453,577
05000	METALS	$291,528
06000	WOODS, PLASTICS & COMPOSITES	$76,158
07000	THERMAL & MOISTURE PROTECTION SYSTEM	$321,400
08000	OPENINGS	$386,332
09000	FINISHES	$474,649
10000	SPECIALTIES	$34,474
11000	EQUIPMENT	$9,138
12000	FURNISHINGS	$167,400
13000	SPECIAL CONSTRUCTION	$35,000
14000	CONVEYING EQUIPMENT	$72,197
21000	FIRE SUPPRESSION	$65,380
22000	PLUMBING	$89,759
23000	HEATING, VENTILATING & AIR CONDITIONING	$662,764
26000	ELECTRICAL	$204,958
27000	COMMUNICATIONS	$0
28000	ELECTRONIC SAFETY AND SECURITY	$0
31000	EARTHWORK	$46,801
32000	EXTERIOR IMPROVEMENTS	$111,517
33000	UTILITIES	$157,368
	SUBTOTAL	**$3,880,088**
	ESCALATION TO MID-POINT OF CONSTRUCTION 21.7%	$840,039
	GENERAL CONDITIONS/BOND/INSURANCE 15.0%	$708,019
	CONTRACTOR'S FEES 3.5%	$189,985
	DESIGN CONTINGENCY 15.0%	$842,720
	TOTAL ESTIMATED CONSTRUCTION COSTS	**$6,460,851**

DESCRIPTION	QTY	UM	UNIT COST	TOTAL COST
OPTION 01 1956 RENOVATION				
02000 EXISTING CONDITIONS				
02100 Selective Demolition				
Remove partitions	2,562	SQFT	2.92	7,492
Remove flooring	3,547	SQFT	1.86	6,607
Remove door and frame, single	5	EACH	105.37	527
Remove revolving door	1	EACH	558.80	559
SUBTOTAL: Selective Demolition				**$15,184**
02200 Environmental Abatement				
Abatement of basement	5,883	SQFT	9.37	55,103
SUBTOTAL: Environmental Abatement				**$55,103**
TOTAL: EXISTING CONDITIONS				**$70,287**
04000 MASONRY				
04200 Exterior Masonry Restoration				
Remove and rebuild brick facade - given quantity	500	SQFT	154.75	77,377
Remove exterior door and modify existing masonry to receive window	1	LSUM	8,480.40	8,480
Multi wythe re-construction at areas where windows and AC units have been removed, 2'-0" x 5'-0"	26	EACH	1,360.13	35,363
Masonry repairs behind downspouts, quantity assumption	6	EACH	555.05	3,330
Removal and reinstallation of stone coping	553	LNFT	63.54	35,140
Repair 8 courses of masonry at perimter of building, remove and reinstall cornice, 2'-0" high	553	LNFT	245.02	135,494
Miscellaneous masonry repair adjacent to domed roof	1	LSUM	25,000.00	25,000
SUBTOTAL: Exterior Masonry Restoration				**$320,185**
TOTAL: MASONRY				**$320,185**
05000 METALS				
05100 Structural Steel				
Install roof beams over room 124 to reinforce roof for installation of deck above	263	SQFT	32.15	8,454
Remove supporting roof girder posts at new opened multipurpose room space. Provide new steel beams and column with footing to provide sufficient support for existing roof above	1,000	SQFT	38.88	38,881
SUBTOTAL: Structural Steel				**$47,335**
TOTAL: METALS				**$47,335**
06000 WOODS, PLASTICS & COMPOSITES				
06200 Rough Carpentry				
Install palletized roof deck on existing roof	395	SQFT	29.09	11,491
Provide railing around deck to match original	73	LNFT	277.49	20,257
SUBTOTAL: Rough Carpentry				**$31,748**
TOTAL: WOODS, PLASTICS & COMPOSITES				**$31,748**
07000 THERMAL & MOISTURE PROTECTION				
07400 Roofing				

DESCRIPTION	QTY	UM	UNIT COST	TOTAL COST
Remove and replace single ply sika type membrane with R30 insulation, densdeck cover board, base sheet including flashings and expansion joints	5,533	SQFT	14.58	80,651
SUBTOTAL: Roofing				**$80,651**
07500 Roofing Specialties				
Roof hatch	1	EACH	4,122.16	4,122
Replace all gutters and downspouts	1	LSUM	30,000.00	30,000
SUBTOTAL: Roofing Specialties				**$34,122**
07600 Metal Panel Systems				
Remove and re-clad domed roof with shingle zinc clad copper to match original white color	1,200	SQFT	123.52	148,224
SUBTOTAL: Metal Panel Systems				**$148,224**
TOTAL: THERMAL & MOISTURE PROTECTION				**$262,997**
08000 OPENINGS				
08100 Windows				
Install window into modified masonry door opening	1	EACH	4,212.70	4,213
Repair windows, assume custom wood clad	450	SQFT	55.67	25,052
SUBTOTAL: Windows				**$29,265**
08300 Exterior Doors, Frames, & Hardware				
Restore exterior doors, frames and hardware, single	2	EACH	5,801.80	11,604
Exterior doors, frames and hardware, single	1	EACH	4,641.44	4,641
Door operator	1	EACH	3,800.00	3,800
SUBTOTAL: Exterior Doors, Frames, & Hardware				**$20,045**
08400 Interior Doors, Frames, & Hardware				
Interior doors, frames and hardware	13	EACH	2,971.81	38,633
SUBTOTAL: Interior Doors, Frames, & Hardware				**$38,633**
08500 Interior Glazing				
Sliding glass door system at museum	25	LNFT	1,209.02	30,225
SUBTOTAL: Interior Glazing				**$30,225**
08700 Special Glazing Systems				
Skylights	100	SQFT	87.75	8,775
SUBTOTAL: Special Glazing Systems				**$8,775**
TOTAL: OPENINGS				**$126,944**
09000 FINISHES				
09100 Plaster & Gypsum Board				
Partitions	445	SQFT	12.44	5,538
Gypsum board ceiling and soffit	500	SQFT	10.71	5,354
SUBTOTAL: Plaster & Gypsum Board				**$10,892**
09200 Floor Finishes				
Quarry tile floors at kitchen	372	SQFT	20.75	7,720
Quarry tile base at kitchen	80	LNFT	21.55	1,724
Tile floor finish at toilet rooms	175	SQFT	17.57	3,074
Tile floor base at toilet rooms	96	LNFT	17.57	1,686

DESCRIPTION	QTY	UM	UNIT COST	TOTAL COST
Vinyl base	600	LNFT	2.19	1,314
Carpet tile	3,000	SQFT	6.07	18,218
Floor prep	4,250	SQFT	4.68	19,896
SUBTOTAL: Floor Finishes				**$53,632**
09300 Wall Finishes				
Wall tile at toilet rooms	960	SQFT	16.18	15,532
SUBTOTAL: Wall Finishes				**$15,532**
09400 Ceiling Finishes				
ACT system - quantity allowance	4,000	SQFT	7.46	29,829
SUBTOTAL: Ceiling Finishes				**$29,829**
09600 Paints & Coatings				
Paint walls	5,010	SQFT	1.25	6,271
Paint ceilings/soffits	500	SQFT	1.53	766
Paint exposed structure	372	SQFT	1.77	658
Epoxy wall finish at kitchen	800	SQFT	3.63	2,905
SUBTOTAL: Paints & Coatings				**$10,599**
09900 Miscellaneous Finishes				
Restoration of miscellaneous observatory rooms to original condition	1,550	SQFT	77.94	120,807
Restoration of room 123	1	LSUM	15,000.00	15,000
Miscellaneous patching - allowance	1	LSUM	10,000.00	10,000
SUBTOTAL: Miscellaneous Finishes				**$145,807**
TOTAL: FINISHES				**$266,291**
10000 SPECIALTIES				
10900 Miscellaneous Specialties				
Miscellaneous specialties allowance	1	LSUM	5,000.00	5,000
SUBTOTAL: Miscellaneous Specialties				**$5,000**
TOTAL: SPECIALTIES				**$5,000**
11000 EQUIPMENT				
11400 Audio & Visual Equipment				
Ceiling mounted projector	1	EACH	3,855.25	3,855
Projection screen	1	EACH	2,641.44	2,641
Kitchen equipment (minimal) - allowance	1	LSUM	5,000.00	5,000
SUBTOTAL: Audio & Visual Equipment				**$11,497**
TOTAL: EQUIPMENT				**$11,497**
12000 FURNISHINGS				
12900 Miscellaneous Furnishings				
Miscellaneous fixtures at gallery and astronomy virtual teaching classroom - allowance	1	LSUM	150,000.00	150,000
Conference rooms - allowance	1	EACH	5,000.00	5,000
SUBTOTAL: Miscellaneous Furnishings				**$155,000**
TOTAL: FURNISHINGS				**$155,000**

DESCRIPTION	QTY	UM	UNIT COST	TOTAL COST
13000 SPECIAL CONSTRUCTION				
13900 Miscellaneous Special Construction				
Restoration of astronomical clock	1	LSUM	35,000.00	35,000
SUBTOTAL: Miscellaneous Special Construction				**$35,000**
TOTAL: SPECIAL CONSTRUCTION				**$35,000**
14000 CONVEYING EQUIPMENT				
14500 Lifts				
Exterior accessible lift serving roof deck including framing and extension onto roof deck	1	EACH	72,197.10	72,197
SUBTOTAL: Lifts				**$72,197**
TOTAL: CONVEYING EQUIPMENT				**$72,197**
21000 FIRE SUPPRESSION				
21200 Fire Sprinkler Equipment & Specialties				
Wet sprinkler system - $/SF	9,600	SQFT	3.25	31,203
SUBTOTAL: Fire Sprinkler Equipment & Specialties				**$31,203**
21300 Sprinkler Heads & Piping				
Route new water service - combined domestic water and fire protection	1	LSUM	8,500.00	8,500
SUBTOTAL: Sprinkler Heads & Piping				**$8,500**
TOTAL: FIRE SUPPRESSION				**$39,703**
22000 PLUMBING				
22100 Selective Demolition				
Remove existing plumbing fixtures, galvanized piping, and existing sump pump	9,500	SQFT	0.20	1,942
SUBTOTAL: Selective Demolition				**$1,942**
22200 Plumbing Fixtures				
Water closet, wall hung, hardwired sensor-op flush valve	3	EACH	2,339.46	7,018
Lavatory, wall hung, hardwired sensor-op faucet	3	EACH	2,401.88	7,206
Urinal, wall hung, hardwired automatic flush valve	1	EACH	2,251.47	2,251
Electric water cooler, ADA-bilevel	1	EACH	4,659.98	4,660
SUBTOTAL: Plumbing Fixtures				**$21,135**
22300 Plumbing Equipment & Specialties				
Domestic water heater, gas-fired	1	EACH	2,972.23	2,972
DHW recirculating pump	1	EACH	1,299.66	1,300
Expansion tank	1	EACH	380.77	381
Thermostatic mixing valve - central	1	EACH	2,043.32	2,043
Replace existing sump pump w/new in existing pit	1	EACH	1,671.66	1,672
Provide new ejector pump in new pit and basin	1	EACH	4,173.28	4,173
Floor drains	3	EACH	464.41	1,393
Cleanouts - wall	3	EACH	308.66	926
Vent thru roof	2	EACH	253.75	507
SUBTOTAL: Plumbing Equipment & Specialties				**$15,368**
22400 Domestic Water, Waste & Vent, & Storm Drainage Piping				

DESCRIPTION	QTY	UM	UNIT COST	TOTAL COST
Domestic water pipe, fittings, and supports, 1-1/4" type L copper avg.	300	LNFT	35.76	10,728
Pipe insulation, 1-1/4" domestic water piping, avg.	300	LNFT	7.56	2,268
Sanitary/waste pipe, fittings, and supports, CI no-hub, AG, 4" avg.	100	LNFT	52.49	5,249
Vent pipe, fittings, and supports, CI no-hub, AG, 2" avg.	150	LNFT	41.40	6,211
Tie new domestic water piping into existing	1	LSUM	841.12	841
Tie new sanitary/waste piping into existing	1	LSUM	780.85	781
Tie new vent piping into existing	1	LSUM	697.62	698
Coring and fireproofing	1	EACH	184.06	184
Pipe and valve tagging	300	LNFT	0.96	287
System pressure testing, water pipe chlorination, and pipe flushing - domestic plumbing	1	LSUM	2,059.92	2,060
SUBTOTAL: Domestic Water, Waste & Vent, & Storm Drainage Piping				**$29,307**
TOTAL: PLUMBING				**$67,752**

23000 HEATING VENTILATION & AIR CONDITIONING

23100 Selective Demolition

Remove existing HVAC, AC units, radiators, convectors, piping, and controls thorughout area to be renovated	9,500	SQFT	0.40	3,846
SUBTOTAL: Selective Demolition				**$3,846**

23200 Ventilation & Exhaust

Fancoil units, 4-pipe hydronic	12	EACH	2,626.13	31,514
FCU coil connections - valves, fittings, and insulation	24	EACH	465.22	11,165
SUBTOTAL: Ventilation & Exhaust				**$42,679**

23300 Central Hydronic & Steam Equipment & Specialties

Heat exchanger, shell & tube	1	EACH	6,364.97	6,365
Chiller, reversible, ground source (based on 30 tons)	1	EACH	24,737.24	24,737
Hydronic system pump, 5 hp, base-mount (ground source, CHW, HW)	6	EACH	4,314.98	25,890
Variable frequency drive, pump, 5 hp	6	EACH	1,988.74	11,932
Vibration isolation, pumps	6	EACH	1,671.66	10,030
Isolation valves, pumps, butterfly, 4"	6	EACH	693.24	4,159
Flexible pump connections, 4"	12	EACH	271.66	3,260
Suction diffuser, 4"	6	EACH	1,583.24	9,499
Triple duty valve, 4"	6	EACH	2,183.24	13,099
Pump strainer, Y-type, 4"	6	EACH	555.24	3,331
Expansion tank	3	EACH	4,866.50	14,599
Air separator, 4"	3	EACH	2,486.24	7,459
Chemical pot feeder	3	EACH	1,243.32	3,730
Makeup water system	3	EACH	2,967.60	8,903
SUBTOTAL: Central Hydronic & Steam Equipment & Specialties				**$146,995**

23500 HVAC Piping

CHWS/R piping, std. wgt. blk. steel pipe, fittings, and supports, welded/flanged, 2-1/2"	200	LNFT	59.34	11,869
CHWS/R pipe, type L copper pipe, fittings, and supports, 1"	600	LNFT	32.48	19,487
HHWS/R pipe, type L copper pipe, fittings, and supports, 2"	200	LNFT	52.97	10,594
HHWS/R pipe, type L copper pipe, fittings, and supports, 1"	600	LNFT	32.48	19,487
Pipe insulation, CHWS/R, 2-1/2"	200	LNFT	10.26	2,052

DESCRIPTION	QTY	UM	UNIT COST	TOTAL COST
Pipe insulation, CHWS/R, 1"	600	LNFT	7.39	4,431
Pipe insulation, HHWS/R, 2"	200	LNFT	9.65	1,930
Pipe insulation, HHWS/R, 1"	600	LNFT	7.39	4,431
SUBTOTAL: HVAC Piping				**$74,280**
23600 Temperature Controls				
DDC controls - exhaust fan, general, toilet	1	EACH	1,200.00	1,200
DDC controls - fancoil units	12	EACH	1,000.00	12,000
DDC controls - heat exchanger, shell & tube	1	EACH	4,000.00	4,000
DDC controls - chiller, water-cooled, ground source (based on 40 tons)	1	EACH	3,000.00	3,000
DDC controls - hydronic pumps, variable speed	6	EACH	3,000.00	18,000
Thermostats/temperature sensors	12	EACH	300.00	3,600
Miscellaneous points & devices	1	LSUM	5,000.00	5,000
Engineer's station	1	LSUM	10,000.00	10,000
Interface with university campus BAS-DDC	1	LSUM	10,000.00	10,000
Programming, testing, and training	1	LSUM	5,000.00	5,000
SUBTOTAL: Temperature Controls				**$71,800**
23700 Testing, Balancing, & Commissioning				
Pipe system testing and balancing	1	LSUM	2,500.00	2,500
HVAC system commissioning	1	LSUM	1,500.00	1,500
SUBTOTAL: Testing, Balancing, & Commissioning				**$4,000**
TOTAL: HEATING VENTILATION & AIR CONDITIONING				**$343,600**
26000 ELECTRICAL				
26900 Miscellaneous Electrical				
Electrical upgrades	1	LSUM	75,000.00	75,000
SUBTOTAL: Miscellaneous Electrical				**$75,000**
TOTAL: ELECTRICAL				**$75,000**
31000 EARTHWORK				
31100 Site Preparation & Excavation				
Excavate, prepare bed, and backfill for tree pit/planting beds, by machine	75	CUYD	33.68	2,526
Excavate, prepare prepare substrate for pavement base	100	CUYD	6.38	638
SUBTOTAL: Site Preparation & Excavation				**$3,164**
31300 Foundation Excavation & Fill				
Haul off excavated material as CCDD	100	CUYD	29.24	2,924
SUBTOTAL: Foundation Excavation & Fill				**$2,924**
TOTAL: EARTHWORK				**$6,088**
32000 EXTERIOR IMPROVEMENTS				
32100 Pavement				
CA-1 at pervious pavers	40	CUYD	42.65	1,706
CA-7, at pervious pavers	20	CUYD	37.32	746
CA-16 at pervious pavers	5	CUYD	57.28	286
Filter fabric	2,000	SQFT	1.05	2,105
Concrete barrier curb at perimeter of pervious pavers	311	LNFT	17.57	5,464

DESCRIPTION	QTY	UM	UNIT COST	TOTAL COST
Pervious pavers	1,614	SQFT	7.24	11,687
Concrete walk	732	SQFT	4.99	3,655
Concrete porch at south including stairs, railings and stoop	1	EACH	11,435.20	11,435
Switchback ramp including stairs, railings and stoop	1	EACH	38,238.22	38,238
Remove switchback ramp at north	1	EACH	6,435.20	6,435
SUBTOTAL: Pavement				**$81,759**
32600 Landscaping				
Trees	3	EACH	943.75	2,831
Defensive plantings at window locations	38	EACH	208.75	7,933
Sod, fescue	1,889	SQFT	0.88	1,669
Landscape imporvements at area of removed ramp	1	LSUM	5,000.00	5,000
SUBTOTAL: Landscaping				**$17,433**
TOTAL: EXTERIOR IMPROVEMENTS				**$99,193**
33000 UTILITIES				
33500 Site HVAC				
Rework steam service piping - route to new heat exchanger	1	LSUM	17,368.13	17,368
SUBTOTAL: Site HVAC				**$17,368**
33900 Special Utilities				
Geothermal wellfield, including bores, vaults, and field piping	40	TON	3,500.00	140,000
SUBTOTAL: Special Utilities				**$140,000**
TOTAL: UTILITIES				**$157,368**
TOTAL: OPTION 01 1956 RENOVATION				**$2,193,184**

DESCRIPTION	QTY	UM	UNIT COST	TOTAL COST
OPTION 02 1956 & 1965 RENOVATIONS				
02000 EXISTING CONDITIONS				
02100 Selective Demolition				
Remove partitions	5,570	SQFT	2.92	16,288
Remove flooring	6,547	SQFT	1.86	12,194
Remove door and frame, single	29	EACH	105.37	3,056
Remove revolving door	1	EACH	558.80	559
SUBTOTAL: Selective Demolition				**$32,097**
02200 Environmental Abatement				
Abatement of basement	5,883	SQFT	9.37	55,103
SUBTOTAL: Environmental Abatement				**$55,103**
TOTAL: EXISTING CONDITIONS				**$87,199**
04000 MASONRY				
04200 Exterior Masonry Restoration				
Remove and rebuild brick facade - given quantity	500	SQFT	154.75	77,377
Remove exterior door and modify existing masonry to receive window	1	LSUM	8,480.40	8,480
Multi wythe re-construction at areas where windows and AC units have been removed, 2'-0" x 5'-0"	26	EACH	1,360.13	35,363
Masonry repairs behind downspouts, quantity assumption	6	EACH	555.05	3,330
Removal and reinstallation of stone coping	553	LNFT	63.54	35,140
Repair 8 courses of masonry at perimter of building, remove and reinstall cornice, 2'-0" high	553	LNFT	245.02	135,494
Miscellaneous masonry repair adjacent to domed roof	1	LSUM	25,000.00	25,000
SUBTOTAL: Exterior Masonry Restoration				**$320,185**
TOTAL: MASONRY				**$320,185**
05000 METALS				
05100 Structural Steel				
Install roof beams over room 124 to reinforce roof for installation of deck above	263	SQFT	32.15	8,454
Remove supporting roof girder posts at new opened multipurpose room space. Provide new steel beams and column with footing to provide sufficient support for existing roof above	1,000	SQFT	38.88	38,881
Support roof framing at 1965 wing with new steel beams that span to new steel columns and extend down to new cast-in-place concrete footings below the existing basement slab on grade (Allow 6 column locations)	1	LSUM	122,164.80	122,165
SUBTOTAL: Structural Steel				**$169,500**
TOTAL: METALS				**$169,500**
06000 WOODS, PLASTICS & COMPOSITES				
06200 Rough Carpentry				
Install palletized roof deck on existing roof	395	SQFT	29.09	11,491
Provide railing around deck to match original	73	LNFT	277.49	20,257
SUBTOTAL: Rough Carpentry				**$31,748**
06300 Millwork				

DESCRIPTION	QTY	UM	UNIT COST	TOTAL COST
Kitchen island	13	LNFT	492.63	6,404
P-lam base cabinets and solid surface countertops	13	LNFT	390.56	5,077
P-lam wall hung cabinets	13	LNFT	238.42	3,099
Reception desk	19	LNFT	640.92	12,178
SUBTOTAL: Millwork				**$26,758**
TOTAL: WOODS, PLASTICS & COMPOSITES				**$58,507**
07000 THERMAL & MOISTURE PROTECTION				
07400 Roofing				
Remove and replace single ply sika type membrane with R30 insulation, densdeck cover board, base sheet including flashings and expansion joints	5,533	SQFT	14.58	80,651
SUBTOTAL: Roofing				**$80,651**
07500 Roofing Specialties				
Roof hatch	1	EACH	4,122.16	4,122
Replace all gutters and downspouts	1	LSUM	30,000.00	30,000
SUBTOTAL: Roofing Specialties				**$34,122**
07600 Metal Panel Systems				
Remove and re-clad domed roof with shingle zinc clad copper to match original white color	1,200	SQFT	123.52	148,224
SUBTOTAL: Metal Panel Systems				**$148,224**
TOTAL: THERMAL & MOISTURE PROTECTION				**$262,997**
08000 OPENINGS				
08100 Windows				
Install window into modified masonry door opening	1	EACH	4,212.70	4,213
Repair windows, assume custom wood clad	450	SQFT	55.67	25,052
SUBTOTAL: Windows				**$29,265**
08300 Exterior Doors, Frames, & Hardware				
Restore exterior doors, frames and hardware, double	1	EACH	8,042.34	8,042
Restore exterior doors, frames and hardware, single	3	EACH	5,801.80	17,405
Exterior doors, frames and hardware, single	1	EACH	4,641.44	4,641
Door operator	1	EACH	3,800.00	3,800
SUBTOTAL: Exterior Doors, Frames, & Hardware				**$33,889**
08400 Interior Doors, Frames, & Hardware				
Interior doors, frames and hardware	13	EACH	2,971.81	38,633
SUBTOTAL: Interior Doors, Frames, & Hardware				**$38,633**
08500 Interior Glazing				
Sliding glass door system at museum	25	LNFT	1,209.02	30,225
Interior glass partition	341	SQFT	50.03	17,059
Glass doors	3	EACH	1,891.65	5,675
SUBTOTAL: Interior Glazing				**$52,959**
08700 Special Glazing Systems				
Skylights	100	SQFT	87.75	8,775
SUBTOTAL: Special Glazing Systems				**$8,775**

DESCRIPTION	QTY	UM	UNIT COST	TOTAL COST
TOTAL: OPENINGS				**$163,522**
09000 FINISHES				
09100 Plaster & Gypsum Board				
Partitions	713	SQFT	12.44	8,873
Gypsum board ceiling and soffit	800	SQFT	10.71	8,567
SUBTOTAL: Plaster & Gypsum Board				**$17,440**
09200 Floor Finishes				
Quarry tile floors at kitchen	372	SQFT	20.75	7,720
Quarry tile base at kitchen	80	LNFT	21.55	1,724
Tile floor finish at toilet rooms	420	SQFT	17.57	7,378
Tile floor base at toilet rooms	190	LNFT	17.57	3,337
Vinyl base	1,000	LNFT	2.19	2,191
Carpet tile	5,755	SQFT	6.07	34,947
Floor prep	6,547	SQFT	4.68	30,648
SUBTOTAL: Floor Finishes				**$87,946**
09300 Wall Finishes				
Wall tile at toilet rooms	1,900	SQFT	16.18	30,741
SUBTOTAL: Wall Finishes				**$30,741**
09400 Ceiling Finishes				
ACT system - quantity allowance	6,000	SQFT	7.46	44,743
SUBTOTAL: Ceiling Finishes				**$44,743**
09600 Paints & Coatings				
Paint walls	8,450	SQFT	1.25	10,576
Paint ceilings/soffits	800	SQFT	1.53	1,226
Paint exposed structure	372	SQFT	1.77	658
Epoxy wall finish at kitchen	800	SQFT	3.63	2,905
SUBTOTAL: Paints & Coatings				**$15,364**
09900 Miscellaneous Finishes				
Restoration of miscellaneous observatory rooms to original condition	1,550	SQFT	77.94	120,807
Restoration of room 123	1	LSUM	15,000.00	15,000
Miscellaneous patching - allowance	1	LSUM	20,000.00	20,000
SUBTOTAL: Miscellaneous Finishes				**$155,807**
TOTAL: FINISHES				**$352,040**
10000 SPECIALTIES				
10900 Miscellaneous Specialties				
Miscellaneous specialties allowance	1	LSUM	8,000.00	8,000
SUBTOTAL: Miscellaneous Specialties				**$8,000**
TOTAL: SPECIALTIES				**$8,000**
11000 EQUIPMENT				
11400 Audio & Visual Equipment				
Ceiling mounted projector	1	EACH	3,855.25	3,855
Projection screen	1	EACH	2,641.44	2,641

DESCRIPTION	QTY	UM	UNIT COST	TOTAL COST
SUBTOTAL: Audio & Visual Equipment				**$6,497**
TOTAL: EQUIPMENT				**$6,497**
12000 FURNISHINGS				
12900 Miscellaneous Furnishings				
Book case	62	LNFT	200.00	12,400
Miscellaneous fixtures at gallery and astronomy virtual teaching classroom - allowance	1	LSUM	150,000.00	150,000
Conference rooms - allowance	1	EACH	5,000.00	5,000
SUBTOTAL: Miscellaneous Furnishings				**$167,400**
TOTAL: FURNISHINGS				**$167,400**
13000 SPECIAL CONSTRUCTION				
13900 Miscellaneous Special Construction				
Restoration of astronomical clock	1	LSUM	35,000.00	35,000
SUBTOTAL: Miscellaneous Special Construction				**$35,000**
TOTAL: SPECIAL CONSTRUCTION				**$35,000**
14000 CONVEYING EQUIPMENT				
14500 Lifts				
Exterior accessible lift serving roof deck including framing and extension onto roof deck	1	EACH	72,197.10	72,197
SUBTOTAL: Lifts				**$72,197**
TOTAL: CONVEYING EQUIPMENT				**$72,197**
21000 FIRE SUPPRESSION				
21200 Fire Sprinkler Equipment & Specialties				
Wet sprinkler system - $/SF	12,600	SQFT	3.25	40,954
SUBTOTAL: Fire Sprinkler Equipment & Specialties				**$40,954**
21300 Sprinkler Heads & Piping				
Route new water service - combined domestic water and fire protection	1	LSUM	8,500.00	8,500
SUBTOTAL: Sprinkler Heads & Piping				**$8,500**
TOTAL: FIRE SUPPRESSION				**$49,454**
22000 PLUMBING				
22100 Selective Demolition				
Remove existing plumbing fixtures, galvanized piping, and existing sump pump	9,500	SQFT	0.20	1,942
SUBTOTAL: Selective Demolition				**$1,942**
22200 Plumbing Fixtures				
Water closet, wall hung, hardwired sensor-op flush valve	3	EACH	2,339.46	7,018
Lavatory, wall hung, hardwired sensor-op faucet	3	EACH	2,401.88	7,206
Urinal, wall hung, hardwired automatic flush valve	1	EACH	2,251.47	2,251
Sink, kitchen, stainless steel, single basin self-rimming, manual faucet	1	EACH	1,601.58	1,602
Electric water cooler, ADA-bilevel	1	EACH	4,659.98	4,660
SUBTOTAL: Plumbing Fixtures				**$22,737**

DESCRIPTION	QTY	UM	UNIT COST	TOTAL COST
22300 Plumbing Equipment & Specialties				
Domestic water heater, gas-fired	1	EACH	2,972.23	2,972
DHW recirculating pump	1	EACH	1,299.66	1,300
Expansion tank	1	EACH	380.77	381
Thermostatic mixing valve - central	1	EACH	2,043.32	2,043
Replace existing sump pump w/new in existing pit	1	EACH	1,671.66	1,672
Provide new ejector pump in new pit and basin	1	EACH	4,173.28	4,173
Floor drains	3	EACH	464.41	1,393
Cleanouts - wall	3	EACH	308.66	926
Vent thru roof	2	EACH	253.75	507
SUBTOTAL: Plumbing Equipment & Specialties				**$15,368**
22400 Domestic Water, Waste & Vent, & Storm Drainage Piping				
Domestic water pipe, fittings, and supports, 1-1/4" type L copper avg.	340	LNFT	35.76	12,159
Pipe insulation, 1-1/4" domestic water piping, avg.	340	LNFT	7.56	2,570
Sanitary/waste pipe, fittings, and supports, CI no-hub, AG, 4" avg.	110	LNFT	52.49	5,774
Vent pipe, fittings, and supports, CI no-hub, AG, 2" avg.	170	LNFT	41.40	7,039
Tie new domestic water piping into existing	1	LSUM	841.12	841
Tie new sanitary/waste piping into existing	1	LSUM	780.85	781
Tie new vent piping into existing	1	LSUM	697.62	698
Coring and fireproofing	1	EACH	184.06	184
Pipe and valve tagging	340	LNFT	0.96	326
System pressure testing, water pipe chlorination, and pipe flushing - domestic plumbing	1	LSUM	2,059.92	2,060
SUBTOTAL: Domestic Water, Waste & Vent, & Storm Drainage Piping				**$32,431**
TOTAL: PLUMBING				**$72,478**
23000 HEATING VENTILATION & AIR CONDITIONING				
23100 Selective Demolition				
Remove existing HVAC, AC units, radiators, convectors, piping, and controls thorughout building	12,600	SQFT	0.40	5,100
SUBTOTAL: Selective Demolition				**$5,100**
23200 Ventilation & Exhaust				
Fancoil units, 4-pipe hydronic	30	EACH	2,626.13	78,784
FCU coil connections - valves, fittings, and insulation	60	EACH	465.22	27,913
SUBTOTAL: Ventilation & Exhaust				**$106,697**
23300 Central Hydronic & Steam Equipment & Specialties				
Heat exchanger, shell & tube	1	EACH	6,364.97	6,365
Chiller, reversible, ground source (based on 40 tons)	1	EACH	35,621.63	35,622
Hydronic system pump, 5 hp, base-mount (ground source, CHW, HW)	6	EACH	4,314.98	25,890
Variable frequency drive, pump, 5 hp	6	EACH	1,988.74	11,932
Vibration isolation, pumps	6	EACH	1,671.66	10,030
Isolation valves, pumps, butterfly, 4"	6	EACH	693.24	4,159
Flexible pump connections, 4"	12	EACH	271.66	3,260
Suction diffuser, 4"	6	EACH	1,583.24	9,499
Triple duty valve, 4"	6	EACH	2,183.24	13,099
Pump strainer, Y-type, 4"	6	EACH	555.24	3,331

DESCRIPTION	QTY	UM	UNIT COST	TOTAL COST
Expansion tank	3	EACH	4,866.50	14,599
Air separator, 4"	3	EACH	2,486.24	7,459
Chemical pot feeder	3	EACH	1,243.32	3,730
Makeup water system	3	EACH	2,967.60	8,903
SUBTOTAL: Central Hydronic & Steam Equipment & Specialties				**$157,879**
23500 HVAC Piping				
CHWS/R piping, std. wgt. blk. steel pipe, fittings, and supports, welded/flanged, 2-1/2"	400	LNFT	59.34	23,737
CHWS/R pipe, type L copper pipe, fittings, and supports, 1"	1,200	LNFT	32.48	38,973
HHWS/R pipe, type L copper pipe, fittings, and supports, 2"	400	LNFT	52.97	21,188
HHWS/R pipe, type L copper pipe, fittings, and supports, 1"	1,200	LNFT	32.48	38,973
Pipe insulation, CHWS/R, 2-1/2"	400	LNFT	10.26	4,104
Pipe insulation, CHWS/R, 1"	1,200	LNFT	7.39	8,863
Pipe insulation, HHWS/R, 2"	400	LNFT	9.65	3,860
Pipe insulation, HHWS/R, 1"	1,200	LNFT	7.39	8,863
SUBTOTAL: HVAC Piping				**$148,560**
23600 Temperature Controls				
DDC controls - exhaust fan, general, toilet	1	EACH	1,200.00	1,200
DDC controls - fancoil units	30	EACH	1,000.00	30,000
DDC controls - heat exchanger, shell & tube	1	EACH	4,000.00	4,000
DDC controls - chiller, water-cooled, ground source (based on 40 tons)	1	EACH	3,000.00	3,000
DDC controls - hydronic pumps, variable speed	6	EACH	3,000.00	18,000
Thermostats/temperature sensors	30	EACH	300.00	9,000
Miscellaneous points & devices	1	LSUM	5,000.00	5,000
Engineer's station	1	LSUM	10,000.00	10,000
Interface with university campus BAS-DDC	1	LSUM	10,000.00	10,000
Programming, testing, and training	1	LSUM	5,000.00	5,000
SUBTOTAL: Temperature Controls				**$95,200**
23700 Testing, Balancing, & Commissioning				
Pipe system testing and balancing	1	LSUM	4,000.00	4,000
HVAC system commissioning	1	LSUM	3,000.00	3,000
SUBTOTAL: Testing, Balancing, & Commissioning				**$7,000**
TOTAL: HEATING VENTILATION & AIR CONDITIONING				**$520,437**
26000 ELECTRICAL				
26900 Miscellaneous Electrical				
Electrical upgrades	1	LSUM	100,000.00	100,000
SUBTOTAL: Miscellaneous Electrical				**$100,000**
TOTAL: ELECTRICAL				**$100,000**
31000 EARTHWORK				
31100 Site Preparation & Excavation				
Excavate, prepare bed, and backfill for tree pit/planting beds, by machine	75	CUYD	33.68	2,526
Excavate, prepare prepare substrate for pavement base	100	CUYD	6.38	638
SUBTOTAL: Site Preparation & Excavation				**$3,164**

DESCRIPTION	QTY	UM	UNIT COST	TOTAL COST
31300 Foundation Excavation & Fill				
Haul off excavated material as CCDD	100	CUYD	29.24	2,924
SUBTOTAL: Foundation Excavation & Fill				**$2,924**
TOTAL: EARTHWORK				**$6,088**
32000 EXTERIOR IMPROVEMENTS				
32100 Pavement				
CA-1 at pervious pavers	40	CUYD	42.65	1,706
CA-7, at pervious pavers	20	CUYD	37.32	746
CA-16 at pervious pavers	5	CUYD	57.28	286
Filter fabric	2,000	SQFT	1.05	2,105
Concrete barrier curb at perimeter of pervious pavers	311	LNFT	17.57	5,464
Pervious pavers	1,614	SQFT	7.24	11,687
Concrete walk	732	SQFT	4.99	3,655
Concrete porch at south including stairs, railings and stoop	1	EACH	11,435.20	11,435
Switchback ramp including stairs, railings and stoop	1	EACH	38,238.22	38,238
Remove switchback ramp at north	1	EACH	6,435.20	6,435
SUBTOTAL: Pavement				**$81,759**
32600 Landscaping				
Trees	3	EACH	943.75	2,831
Defensive plantings at window locations	38	EACH	208.75	7,933
Sod, fescue	1,889	SQFT	0.88	1,669
Landscape imporvements at area of removed ramp	1	LSUM	5,000.00	5,000
SUBTOTAL: Landscaping				**$17,433**
TOTAL: EXTERIOR IMPROVEMENTS				**$99,193**
33000 UTILITIES				
33500 Site HVAC				
Rework steam service piping - route to new heat exchanger	1	LSUM	17,368.13	17,368
SUBTOTAL: Site HVAC				**$17,368**
33900 Special Utilities				
Geothermal wellfield, including bores, vaults, and field piping	40	TON	3,500.00	140,000
SUBTOTAL: Special Utilities				**$140,000**
TOTAL: UTILITIES				**$157,368**
TOTAL: OPTION 02 1956 & 1965 RENOVATIONS				**$2,708,062**

DESCRIPTION	QTY	UM	UNIT COST	TOTAL COST
OPTION 03 FULL RENOVATION AND NEW ADDITION				
02000 EXISTING CONDITIONS				
02100 Selective Demolition				
Remove partitions	5,570	SQFT	2.92	16,288
Remove flooring	6,547	SQFT	1.86	12,194
Remove door and frame, single	29	EACH	105.37	3,056
Remove revolving door	1	EACH	558.80	559
SUBTOTAL: Selective Demolition				**$32,097**
02200 Environmental Abatement				
Abatement of basement	5,883	SQFT	9.37	55,103
SUBTOTAL: Environmental Abatement				**$55,103**
TOTAL: EXISTING CONDITIONS				**$87,199**
03000 CONCRETE				
03100 Concrete Formwork				
Formwork for strip footings	501	SQFT	7.46	3,737
Formwork for basement walls	3,645	SQFT	12.78	46,581
SUBTOTAL: Concrete Formwork				**$50,319**
03200 Concrete Reinforcement				
Reinforcement in strip footings, avg 65 lbs/cy	1	TONS	2,487.91	2,488
Reinforcement in basement walls, avg 135 lbs/cy	8	TONS	2,873.83	22,991
SUBTOTAL: Concrete Reinforcement				**$25,479**
03300 Cast in Place Concrete				
Concrete in strip footings, 4,000 psi	33	CUYD	176.37	5,820
Concrete in basement walls, 4,000 psi	114	CUYD	197.49	22,514
Concrete basement slab with W6x6-2.9x2.9	2,454	SQFT	5.19	12,738
CA-6 base at basement slab	45	CUYD	32.02	1,441
Vapor barrier at slab	2,454	SQFT	1.13	2,764
SUBTOTAL: Cast in Place Concrete				**$45,276**
03400 Cementitious Decks				
LTWT Concrete on metal deck, 3-1/2" thk, with W6x6-1.4x1.4	2,454	SQFT	4.65	11,414
SUBTOTAL: Cementitious Decks				**$11,414**
TOTAL: CONCRETE				**$132,488**
04000 MASONRY				
04100 Exterior Masonry				
Brick facade, modular, 2-2/3"x8"x4" thk	1,704	SQFT	27.25	46,441
Premium for limestone cornice and coping	167	LNFT	311.08	51,951
SUBTOTAL: Exterior Masonry				**$98,391**
04200 Exterior Masonry Restoration				
Remove and rebuild brick facade - given quantity	500	SQFT	154.75	77,377
Remove exterior door and modify existing masonry to receive window	1	LSUM	8,480.40	8,480

DESCRIPTION	QTY	UM	UNIT COST	TOTAL COST
Multi wythe re-construction at areas where windows and AC units have been removed, 2'-0" x 5'-0"	26	EACH	1,360.13	35,363
Masonry repairs behind downspouts, quantity assumption	6	EACH	555.05	3,330
Removal and reinstallation of stone coping	553	LNFT	63.54	35,140
Repair 8 courses of masonry at perimter of building, remove and reinstall cornice, 2'-0" high	553	LNFT	245.02	135,494
Miscellaneous masonry repair adjacent to domed roof	1	LSUM	25,000.00	25,000
Building connection allowance	1	LSUM	35,000.00	35,000
SUBTOTAL: Exterior Masonry Restoration				**$355,185**
TOTAL: MASONRY				**$453,577**

05000 METALS

05100 Structural Steel

Structural steel beams & columns, floor, allow 11 lbs/sf	2,454	SQFT	16.53	40,565
Structural steel beams & columns, roof, allow 7 lbs/sf	2,454	SQFT	10.49	25,740
Install roof beams over room 124 to reinforce roof for installation of deck above	263	SQFT	32.15	8,454
Remove supporting roof girder posts at new opened multipurpose room space. Provide new steel beams and column with footing to provide sufficient support for existing roof above	1,000	SQFT	38.88	38,881
Support roof framing at 1965 wing with new steel beams that span to new steel columns and extend down to new cast-in-place concrete footings below the existing basement slab on grade (Allow 6 column locations)	1	LSUM	122,164.80	122,165
Composite metal floor deck, 2" thk, 18 ga	2,454	SQFT	2.71	6,657
Metal roof deck, galvanized, 1-1/2" thk, 18 ga	2,454	SQFT	2.56	6,289
Miscellaneous angles, channels, lintels, etc.	4,898	SQFT	1.85	9,083
SUBTOTAL: Structural Steel				**$257,834**

05200 Structural Metal Stud Framing

Structural metal studs, 8" thk	1,704	SQFT	5.10	8,693
SUBTOTAL: Structural Metal Stud Framing				**$8,693**

05300 Stairs

Stair allowance	1	LSUM	25,000.00	25,000
SUBTOTAL: Stairs				**$25,000**
TOTAL: METALS				**$291,528**

06000 WOODS, PLASTICS & COMPOSITES

06200 Rough Carpentry

Miscellaneous wood blocking & rough carpentry	4,898	SQFT	1.48	7,263
Install palletized roof deck on existing roof	395	SQFT	29.09	11,491
Provide railing around deck to match original	73	LNFT	277.49	20,257
SUBTOTAL: Rough Carpentry				**$39,012**

06300 Millwork

Kitchen island	13	LNFT	410.53	5,337
P-lam base cabinets and solid surface countertops	13	LNFT	325.46	4,231
P-lam wall hung cabinets	13	LNFT	198.68	2,583
Reception desk	39	LNFT	640.92	24,996
SUBTOTAL: Millwork				**$37,147**

DESCRIPTION	QTY	UM	UNIT COST	TOTAL COST
TOTAL: WOODS, PLASTICS & COMPOSITES				**$76,158**
07000 THERMAL & MOISTURE PROTECTION				
07100 Dampproofing & Waterproofing				
Waterproofing at basement walls	1,837	SQFT	6.89	12,650
Air and moisture barrier in cavity	1,704	SQFT	3.90	6,652
SUBTOTAL: Dampproofing & Waterproofing				**$19,302**
07200 Thermal Insulation				
2" rigid insulation in cavity	1,704	SQFT	2.82	4,804
SUBTOTAL: Thermal Insulation				**$4,804**
07400 Roofing				
Remove and replace single ply sika type membrane with R30 insulation, densdeck cover board, base sheet including flashings and expansion joints	5,533	SQFT	14.58	80,651
Install single ply sika type membrane with R30 insulation, densdeck cover board, base sheet including flashings and expansion joints	2,454	SQFT	13.50	33,128
SUBTOTAL: Roofing				**$113,778**
07500 Roofing Specialties				
Roof hatch	1	EACH	4,122.16	4,122
Replace all gutters and downspouts	1	LSUM	30,000.00	30,000
SUBTOTAL: Roofing Specialties				**$34,122**
07600 Metal Panel Systems				
Remove and re-clad domed roof with shingle zinc clad copper to match original white color	1,200	SQFT	123.52	148,224
SUBTOTAL: Metal Panel Systems				**$148,224**
07800 Caulking & Sealants				
Miscellaneous caulking & sealants	4,898	SQFT	0.24	1,170
SUBTOTAL: Caulking & Sealants				**$1,170**
TOTAL: THERMAL & MOISTURE PROTECTION				**$321,400**
08000 OPENINGS				
08100 Windows				
Install window into modified masonry door opening	1	EACH	4,212.70	4,213
Repair windows, assume custom wood clad	450	SQFT	55.67	25,052
Provide and install windows, assume custom wood clad	587	SQFT	232.41	136,426
SUBTOTAL: Windows				**$165,691**
08300 Exterior Doors, Frames, & Hardware				
Restore exterior doors, frames and hardware, single	9	EACH	5,801.80	52,216
Exterior doors, frames and hardware, single	1	EACH	4,641.44	4,641
Door operator	1	EACH	3,800.00	3,800
SUBTOTAL: Exterior Doors, Frames, & Hardware				**$60,658**
08400 Interior Doors, Frames, & Hardware				
Interior doors, frames and hardware	28	EACH	2,971.81	83,211
SUBTOTAL: Interior Doors, Frames, & Hardware				**$83,211**
08500 Interior Glazing				

DESCRIPTION	QTY	UM	UNIT COST	TOTAL COST
Sliding glass door system at museum	25	LNFT	1,209.02	30,225
Interior glass partition	566	SQFT	50.03	28,315
Glass doors	5	EACH	1,891.65	9,458
SUBTOTAL: Interior Glazing				**$67,999**
08700 Special Glazing Systems				
Skylights	100	SQFT	87.75	8,775
SUBTOTAL: Special Glazing Systems				**$8,775**
TOTAL: OPENINGS				**$386,332**
09000 FINISHES				
09100 Plaster & Gypsum Board				
Partitions	5,321	SQFT	12.44	66,219
Furring at interior face of exterior walls including insulation	3,374	SQFT	4.55	15,343
Gypsum board ceiling and soffit	500	SQFT	10.71	5,354
SUBTOTAL: Plaster & Gypsum Board				**$86,916**
09200 Floor Finishes				
Quarry tile floors at kitchen	372	SQFT	20.75	7,720
Quarry tile base at kitchen	80	LNFT	21.55	1,724
Tile floor base at toilet rooms	270	LNFT	17.57	4,743
Tile floor finish at toilet rooms	560	SQFT	17.57	9,837
Vinyl base	1,900	LNFT	2.19	4,162
Carpet tile	10,630	SQFT	6.07	64,551
Floor prep	6,547	SQFT	4.68	30,648
SUBTOTAL: Floor Finishes				**$123,385**
09300 Wall Finishes				
Wall tile at toilet rooms	2,560	SQFT	16.18	41,419
SUBTOTAL: Wall Finishes				**$41,419**
09400 Ceiling Finishes				
ACT system	7,908	SQFT	7.46	58,972
SUBTOTAL: Ceiling Finishes				**$58,972**
09600 Paints & Coatings				
Paint walls	18,666	SQFT	1.25	23,362
Paint ceilings/soffits	800	SQFT	1.53	1,226
Paint exposed structure	372	SQFT	1.77	658
Epoxy wall finish at kitchen	800	SQFT	3.63	2,905
SUBTOTAL: Paints & Coatings				**$28,150**
09900 Miscellaneous Finishes				
Restoration of miscellaneous observatory rooms to original condition	1,550	SQFT	77.94	120,807
Restoration of room 123	1	LSUM	15,000.00	15,000
SUBTOTAL: Miscellaneous Finishes				**$135,807**
TOTAL: FINISHES				**$474,649**
10000 SPECIALTIES				
10300 Movable Partitions				

DESCRIPTION	QTY	UM	UNIT COST	TOTAL COST
Moveable partition	320	SQFT	70.23	22,474
SUBTOTAL: Movable Partitions				**$22,474**
10900 Miscellaneous Specialties				
Miscellaneous specialties allowance	1	LSUM	12,000.00	12,000
SUBTOTAL: Miscellaneous Specialties				**$12,000**
TOTAL: SPECIALTIES				**$34,474**
11000 EQUIPMENT				
11400 Audio & Visual Equipment				
Ceiling mounted projector	1	EACH	3,855.25	3,855
Projection screen	2	EACH	2,641.44	5,283
SUBTOTAL: Audio & Visual Equipment				**$9,138**
TOTAL: EQUIPMENT				**$9,138**
12000 FURNISHINGS				
12900 Miscellaneous Furnishings				
Book case	62	LNFT	200.00	12,400
Miscellaneous fixtures at gallery and astronomy virtual teaching classroom - allowance	1	LSUM	150,000.00	150,000
Conference rooms - allowance	1	EACH	5,000.00	5,000
SUBTOTAL: Miscellaneous Furnishings				**$167,400**
TOTAL: FURNISHINGS				**$167,400**
13000 SPECIAL CONSTRUCTION				
13900 Miscellaneous Special Construction				
Restoration of astronomical clock	1	LSUM	35,000.00	35,000
SUBTOTAL: Miscellaneous Special Construction				**$35,000**
TOTAL: SPECIAL CONSTRUCTION				**$35,000**
14000 CONVEYING EQUIPMENT				
14500 Lifts				
Exterior accessible lift serving roof deck including framing and extension onto roof deck	1	EACH	72,197.10	72,197
SUBTOTAL: Lifts				**$72,197**
TOTAL: CONVEYING EQUIPMENT				**$72,197**
21000 FIRE SUPPRESSION				
21200 Fire Sprinkler Equipment & Specialties				
Wet sprinkler system - $/SF	17,500	SQFT	3.25	56,880
SUBTOTAL: Fire Sprinkler Equipment & Specialties				**$56,880**
21300 Sprinkler Heads & Piping				
Route new water service - combined domestic water and fire protection	1	LSUM	8,500.00	8,500
SUBTOTAL: Sprinkler Heads & Piping				**$8,500**
TOTAL: FIRE SUPPRESSION				**$65,380**

DESCRIPTION	QTY	UM	UNIT COST	TOTAL COST
22000 PLUMBING				
22100 Selective Demolition				
Remove existing plumbing fixtures, galvanized piping, and existing sump pump	9,500	SQFT	0.20	1,942
SUBTOTAL: Selective Demolition				**$1,942**
22200 Plumbing Fixtures				
Water closet, wall hung, hardwired sensor-op flush valve	5	EACH	2,339.46	11,697
Lavatory, wall hung, hardwired sensor-op faucet	5	EACH	2,401.88	12,009
Urinal, wall hung, hardwired automatic flush valve	1	EACH	2,251.47	2,251
Sink, kitchen, stainless steel, single basin self-rimming, manual faucet	1	EACH	1,601.58	1,602
Electric water cooler, ADA-bilevel	1	EACH	4,659.98	4,660
SUBTOTAL: Plumbing Fixtures				**$32,220**
22300 Plumbing Equipment & Specialties				
Domestic water heater, gas-fired	1	EACH	2,972.23	2,972
DHW recirculating pump	1	EACH	1,299.66	1,300
Expansion tank	1	EACH	380.77	381
Thermostatic mixing valve - central	1	EACH	2,043.32	2,043
Replace existing sump pump w/new in existing pit	1	EACH	1,671.66	1,672
Provide new ejector pump in new pit and basin	1	EACH	4,173.28	4,173
Floor drains	5	EACH	464.41	2,322
Cleanouts - wall	5	EACH	308.66	1,543
Vent thru roof	3	EACH	253.75	761
SUBTOTAL: Plumbing Equipment & Specialties				**$17,168**
22400 Domestic Water, Waste & Vent, & Storm Drainage Piping				
Domestic water pipe, fittings, and supports, 1-1/4" type L copper avg.	400	LNFT	35.76	14,304
Pipe insulation, 1-1/4" domestic water piping, avg.	400	LNFT	7.56	3,024
Sanitary/waste pipe, fittings, and supports, CI no-hub, AG, 4" avg.	150	LNFT	52.49	7,874
Vent pipe, fittings, and supports, CI no-hub, AG, 2" avg.	200	LNFT	41.40	8,281
Tie new domestic water piping into existing	1	LSUM	841.12	841
Tie new sanitary/waste piping into existing	1	LSUM	780.85	781
Tie new vent piping into existing	1	LSUM	697.62	698
Coring and fireproofing	1	EACH	184.06	184
Pipe and valve tagging	400	LNFT	0.96	383
System pressure testing, water pipe chlorination, and pipe flushing - domestic plumbing	1	LSUM	2,059.92	2,060
SUBTOTAL: Domestic Water, Waste & Vent, & Storm Drainage Piping				**$38,430**
TOTAL: PLUMBING				**$89,759**
23000 HEATING VENTILATION & AIR CONDITIONING				
23100 Selective Demolition				
Remove existing HVAC, AC units, radiators, convectors, piping, and controls thorughout building	12,600	SQFT	0.40	5,100
SUBTOTAL: Selective Demolition				**$5,100**
23200 Ventilation & Exhaust				
Fancoil units, 4-pipe hydronic	45	EACH	2,626.13	118,176
FCU coil connections - valves, fittings, and insulation	90	EACH	465.22	41,870

DESCRIPTION	QTY	UM	UNIT COST	TOTAL COST
SUBTOTAL: Ventilation & Exhaust				**$160,045**
23300 Central Hydronic & Steam Equipment & Specialties				
Heat exchanger, shell & tube	1	EACH	6,364.97	6,365
Chiller, reversible, ground source (based on 50 tons)	1	EACH	49,474.49	49,474
Hydronic system pump, 5 hp, base-mount (ground source, CHW, HW)	6	EACH	4,314.98	25,890
Variable frequency drive, pump, 5 hp	6	EACH	1,988.74	11,932
Vibration isolation, pumps	6	EACH	1,671.66	10,030
Isolation valves, pumps, butterfly, 4"	6	EACH	693.24	4,159
Flexible pump connections, 4"	12	EACH	271.66	3,260
Suction diffuser, 4"	6	EACH	1,583.24	9,499
Triple duty valve, 4"	6	EACH	2,183.24	13,099
Pump strainer, Y-type, 4"	6	EACH	555.24	3,331
Expansion tank	3	EACH	4,866.50	14,599
Air separator, 4"	3	EACH	2,486.24	7,459
Chemical pot feeder	3	EACH	1,243.32	3,730
Makeup water system	3	EACH	2,967.60	8,903
SUBTOTAL: Central Hydronic & Steam Equipment & Specialties				**$171,732**
23500 HVAC Piping				
CHWS/R piping, std. wgt. blk. steel pipe, fittings, and supports, welded/flanged, 2-1/2"	700	LNFT	59.34	41,540
CHWS/R pipe, type L copper pipe, fittings, and supports, 1"	1,350	LNFT	32.48	43,845
HHWS/R pipe, type L copper pipe, fittings, and supports, 2"	700	LNFT	52.97	37,078
HHWS/R pipe, type L copper pipe, fittings, and supports, 1"	1,350	LNFT	32.48	43,845
Pipe insulation, CHWS/R, 2-1/2"	700	LNFT	10.26	7,181
Pipe insulation, CHWS/R, 1"	1,350	LNFT	7.39	9,971
Pipe insulation, HHWS/R, 2"	700	LNFT	9.65	6,755
Pipe insulation, HHWS/R, 1"	1,350	LNFT	7.39	9,971
SUBTOTAL: HVAC Piping				**$200,186**
23600 Temperature Controls				
DDC controls - exhaust fan, general, toilet	1	EACH	1,200.00	1,200
DDC controls - fancoil units	45	EACH	1,000.00	45,000
DDC controls - heat exchanger, shell & tube	1	EACH	4,000.00	4,000
DDC controls - chiller, water-cooled, ground source (based on 40 tons)	1	EACH	3,000.00	3,000
DDC controls - hydronic pumps, variable speed	6	EACH	3,000.00	18,000
Thermostats/temperature sensors	45	EACH	300.00	13,500
Miscellaneous points & devices	1	LSUM	6,500.00	6,500
Engineer's station	1	LSUM	10,000.00	10,000
Interface with university campus BAS-DDC	1	LSUM	10,000.00	10,000
Programming, testing, and training	1	LSUM	6,000.00	6,000
SUBTOTAL: Temperature Controls				**$117,200**
23700 Testing, Balancing, & Commissioning				
Pipe system testing and balancing	1	LSUM	5,000.00	5,000
HVAC system commissioning	1	LSUM	3,500.00	3,500
SUBTOTAL: Testing, Balancing, & Commissioning				**$8,500**
TOTAL: HEATING VENTILATION & AIR CONDITIONING				**$662,764**

DESCRIPTION	QTY	UM	UNIT COST	TOTAL COST
26000 ELECTRICAL				
26900 Miscellaneous Electrical				
Electrical upgrades	1	LSUM	100,000.00	100,000
Service and distribution - Main switchboard, distribution panels, transformers and associated feeders	4,898	SQFT	3.27	16,040
Service and distribution - Branch panelboards and associated feeders	4,898	SQFT	1.94	9,516
Emergency Service and distribution - Distribution panels, ATSs and associated feeders	4,898	SQFT	1.00	4,884
Lighting System - Light fixtures including installation and hook up	4,898	SQFT	7.70	37,713
Lighting System - Emergency and Exit Light fixtures including installation and hook up	4,898	SQFT	0.71	3,453
Lighting System - Branch wiring installation 600 V, including 3/4" EMT conduit and THWN wire, 20A	4,898	SQFT	2.47	12,122
Branch Power - Miscellaneous receptacles and electrical equipment hook up	4,898	SQFT	3.29	16,138
Motors connection, disconnect switches and associated feeders	4,898	SQFT	1.04	5,093
SUBTOTAL: Miscellaneous Electrical				**$204,958**
TOTAL: ELECTRICAL				**$204,958**
31000 EARTHWORK				
31300 Foundation Excavation & Fill				
Excavate for basement	1,419	CUYD	7.39	10,484
Backfill with excavated material	374	CUYD	7.57	2,832
Haul off excavated material as CCDD	1,145	CUYD	29.24	33,485
SUBTOTAL: Foundation Excavation & Fill				**$46,801**
TOTAL: EARTHWORK				**$46,801**
32000 EXTERIOR IMPROVEMENTS				
32100 Pavement				
CA-1 at pervious pavers	40	CUYD	42.65	1,706
CA-7, at pervious pavers	20	CUYD	37.32	746
CA-16 at pervious pavers	5	CUYD	57.28	286
Filter fabric	2,000	SQFT	1.05	2,105
Concrete barrier curb at perimeter of pervious pavers	311	LNFT	17.57	5,464
Pervious pavers	1,614	SQFT	7.24	11,687
Concrete walk	899	SQFT	4.99	4,489
Concrete porch at south including stairs, railings and stoop	2	EACH	11,435.20	22,870
Switchback ramp including stairs, railings and stoop	1	EACH	38,238.22	38,238
Remove switchback ramp at north	1	EACH	6,435.20	6,435
SUBTOTAL: Pavement				**$94,028**
32600 Landscaping				
Trees	3	EACH	943.75	2,831
Defensive plantings at window locations	38	EACH	208.75	7,933
Sod, fescue	1,952	SQFT	0.88	1,725
Landscape imporvements at area of removed ramp	1	LSUM	5,000.00	5,000
SUBTOTAL: Landscaping				**$17,489**
TOTAL: EXTERIOR IMPROVEMENTS				**$111,517**

DESCRIPTION	QTY	UM	UNIT COST	TOTAL COST
33000 UTILITIES				
33500 Site HVAC				
Rework steam service piping - route to new heat exchanger	1	LSUM	17,368.13	17,368
SUBTOTAL: Site HVAC				**$17,368**
33900 Special Utilities				
Geothermal wellfield, including bores, vaults, and field piping	40	TON	3,500.00	140,000
SUBTOTAL: Special Utilities				**$140,000**
TOTAL: UTILITIES				**$157,368**
TOTAL: OPTION 03 FULL RENOVATION AND NEW ADDITION				**$3,880,088**

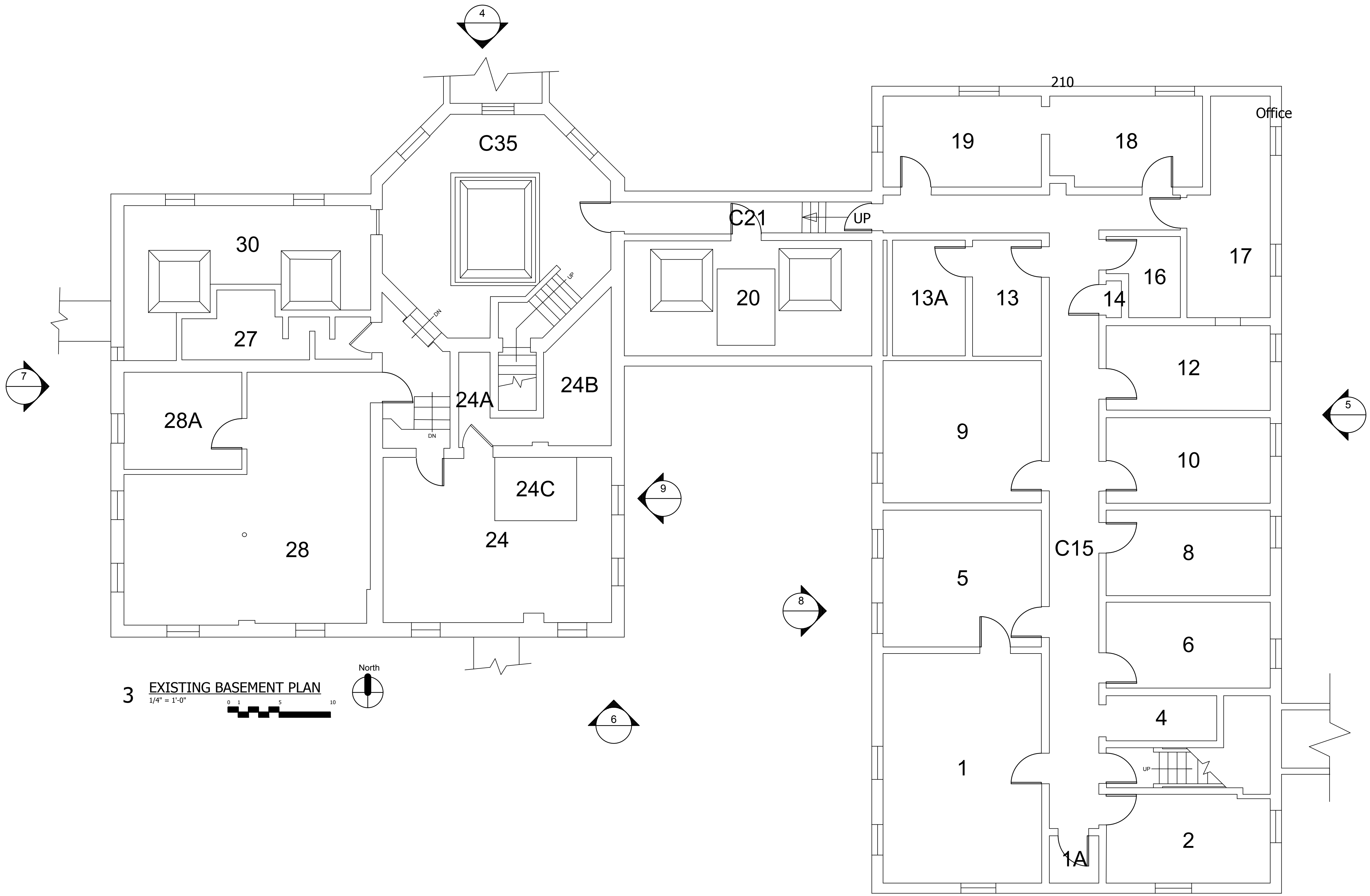
GIS Webmap Public Interface Champaign County, Illinois

25

Feet

NORTH

Date: Wednesday, September 20, 2017



3 EXISTING BASEMENT PLAN
1/4" = 1'-0"

FLOOR: GROUND

SHEET. #: A-1

FILE NAME: U4117 Feasibilty

DATE PRINTED: 26 Mar 2015

NAME AND LOCATION OF STRUCTURE:

ASTRONOMICAL OBSERVATORY FEASIBILITY STUDY - EXISTING

UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

Brush Architects

Brush Architects, LLC
4200 North Francisco
Chicago, IL 60618
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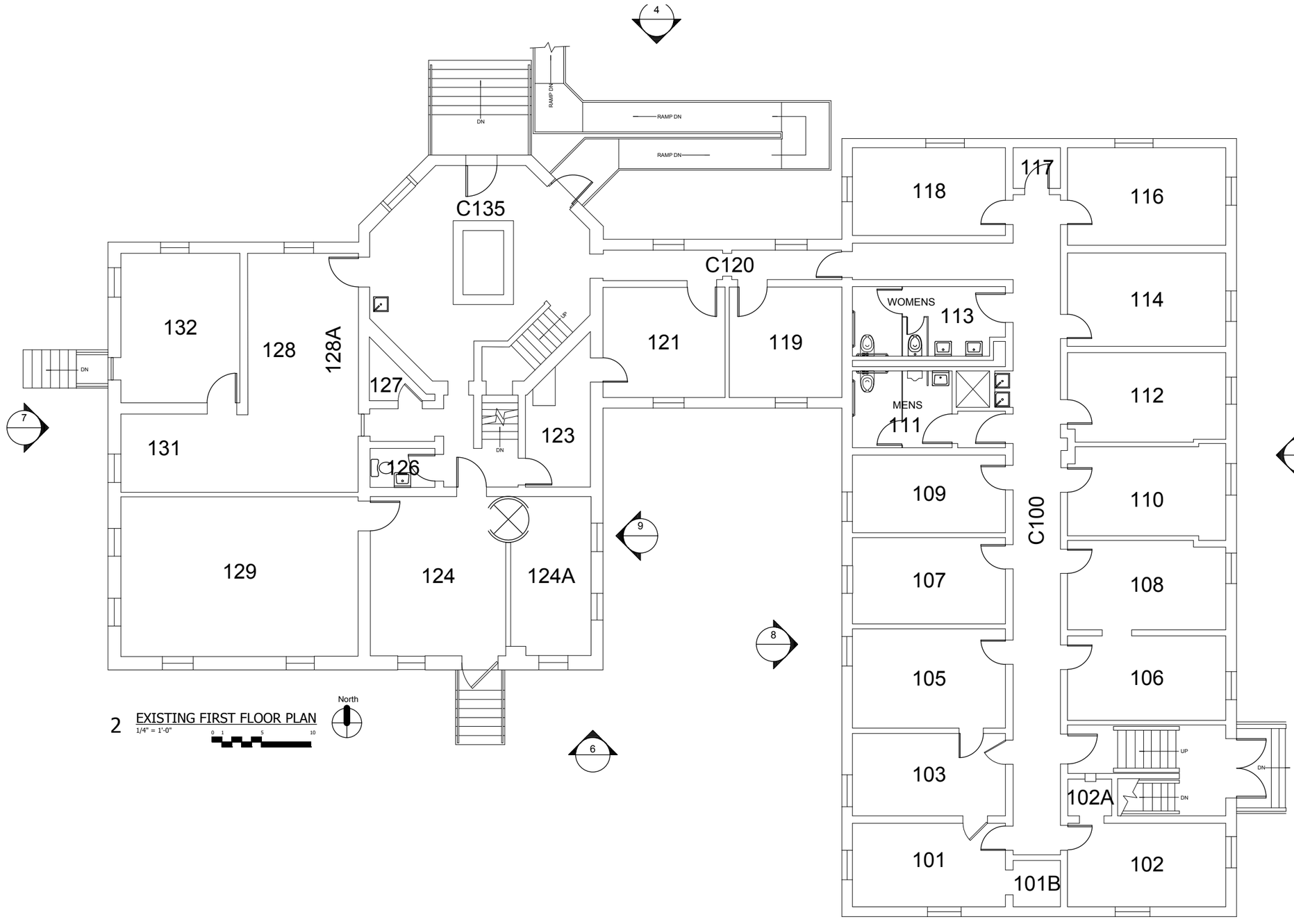
www.brusharchitects.com



2 EXISTING FIRST FLOOR PLAN

1/4" = 1'-0"

NAME AND LOCATION OF STRUCTURE:

ASTRONOMICAL OBSERVATORY
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FLOOR: FIRST

SHEET. # A- 2

FILE NAME: U14117 Feasibility

DATE PRINTED: 26 Mar 2015

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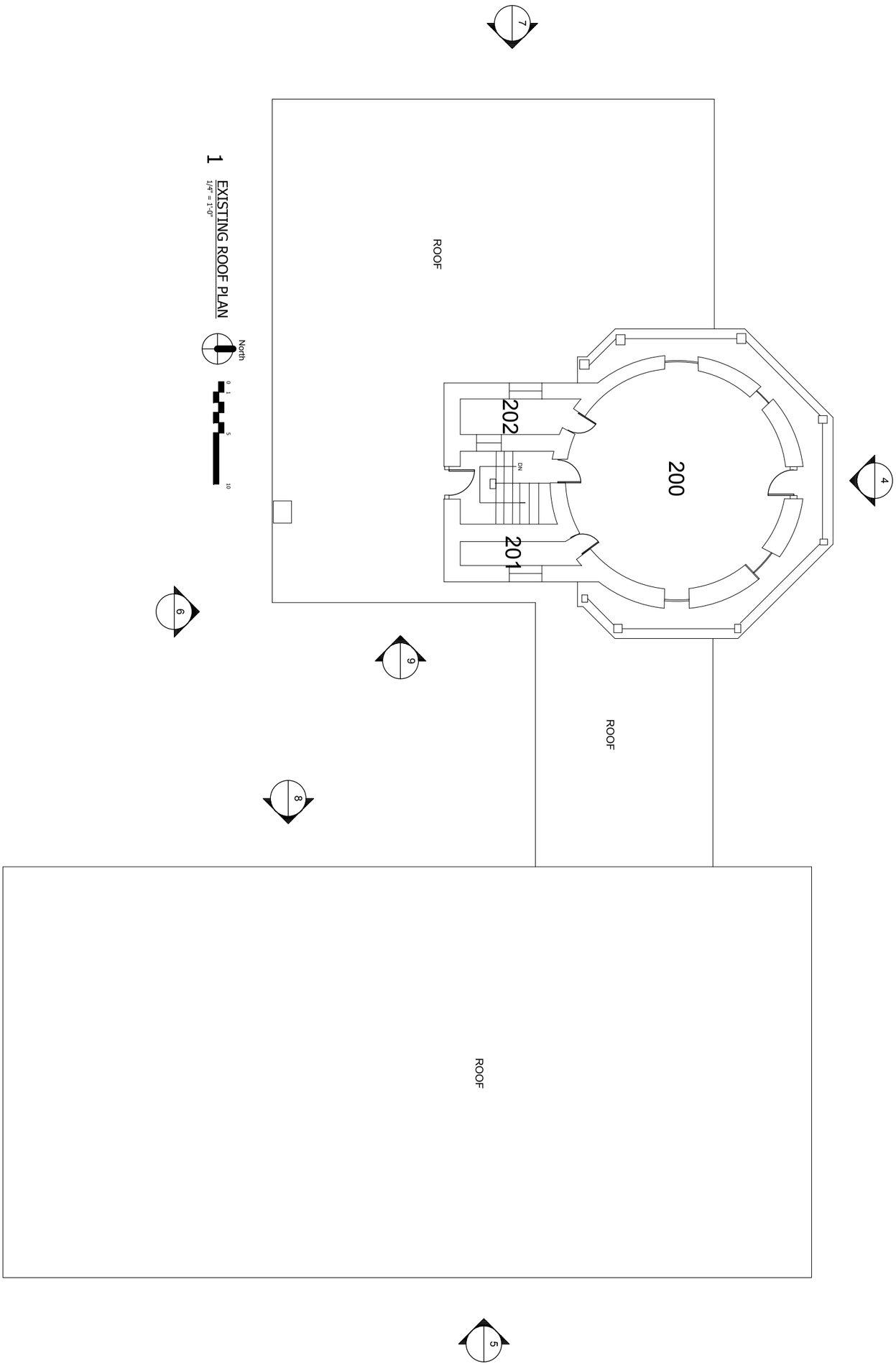

1 EXISTING ROOF PLAN
1/4" = 1'-0"

North

0 1 5 10

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NAME AND LOCATION OF STRUCTURE:

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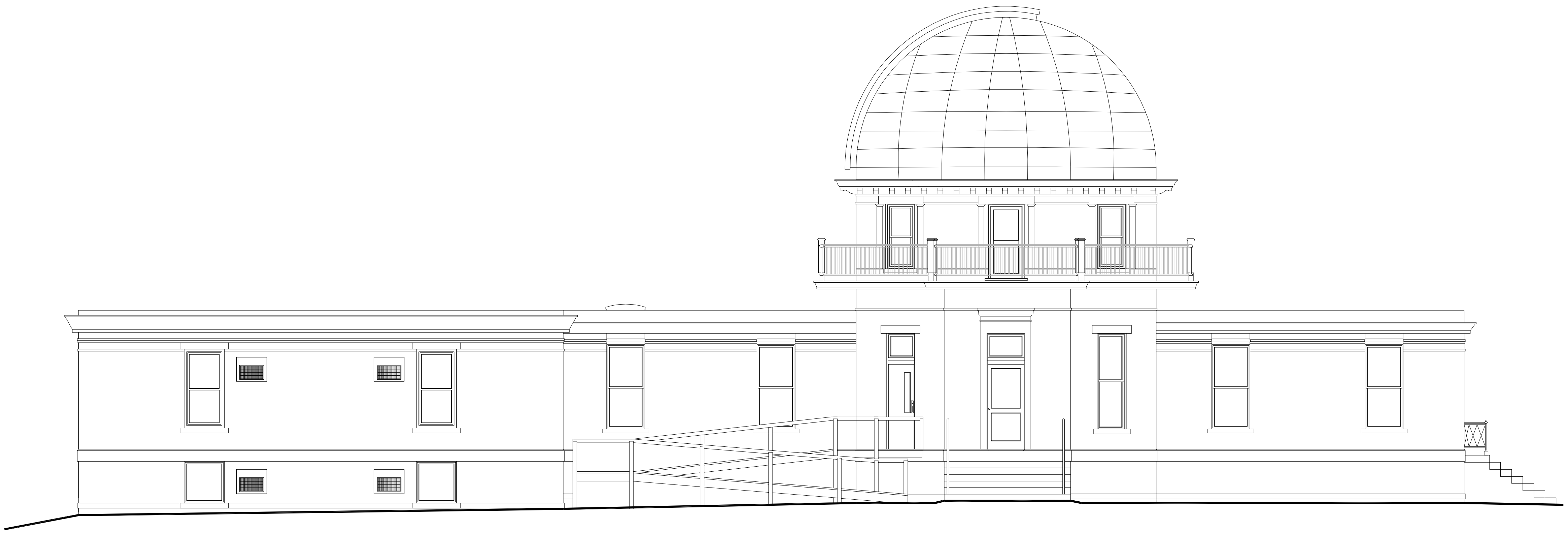
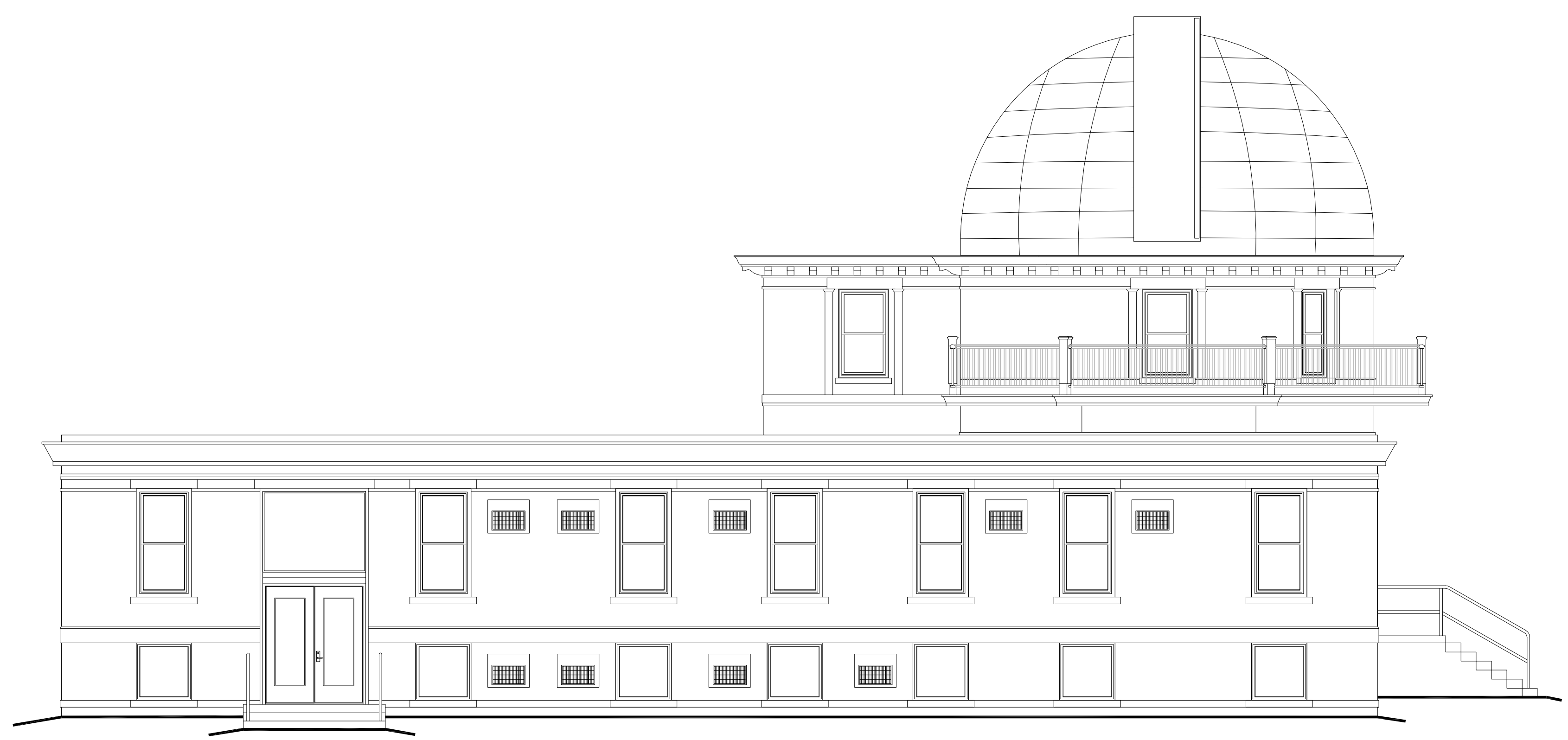
FILE NAME:	FLOOR:
U14117 Feasibilty	SECOND
DATE PRINTED:	SHEET. #
26 Mar 2015	A - 3



4 EXISTING NORTH ELEVATION
1/4" = 1'-0"
0 1 5 10



5 EXISTING EAST ELEVATION
1/4" = 1'-0"
0 1 5 10

FLOOR:
ELEVATIONS

SHEET. #
A - 4

FILE NAME:
U14117 Feasibilty

DATE PRINTED:
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NAME AND LOCATION OF STRUCTURE:
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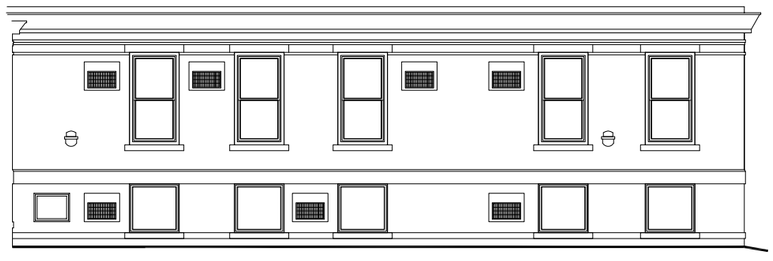

8 EXISTING WEST ELEVATION - PARTIAL
1/4" = 1'-0"

9 EXISTING EAST ELEVATION - PARTIAL
1/4" = 1'-0"

NAME AND LOCATION OF STRUCTURE:
ASTRONOMICAL OBSERVATORY
FEASIBILITY STUDY - EXISTING
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FILE NAME: U14117 Feasibilty
DATE PRINTED: 26 Mar 2015
FLOOR: ELEVATIONS
SHEET. # A - 5

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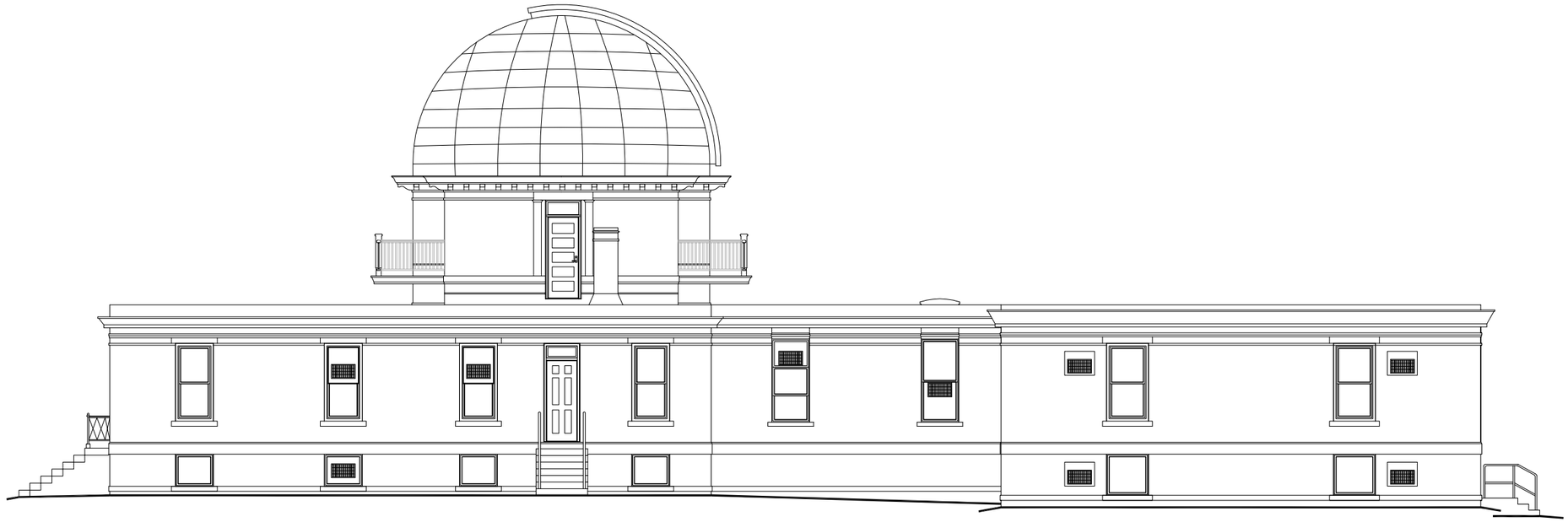
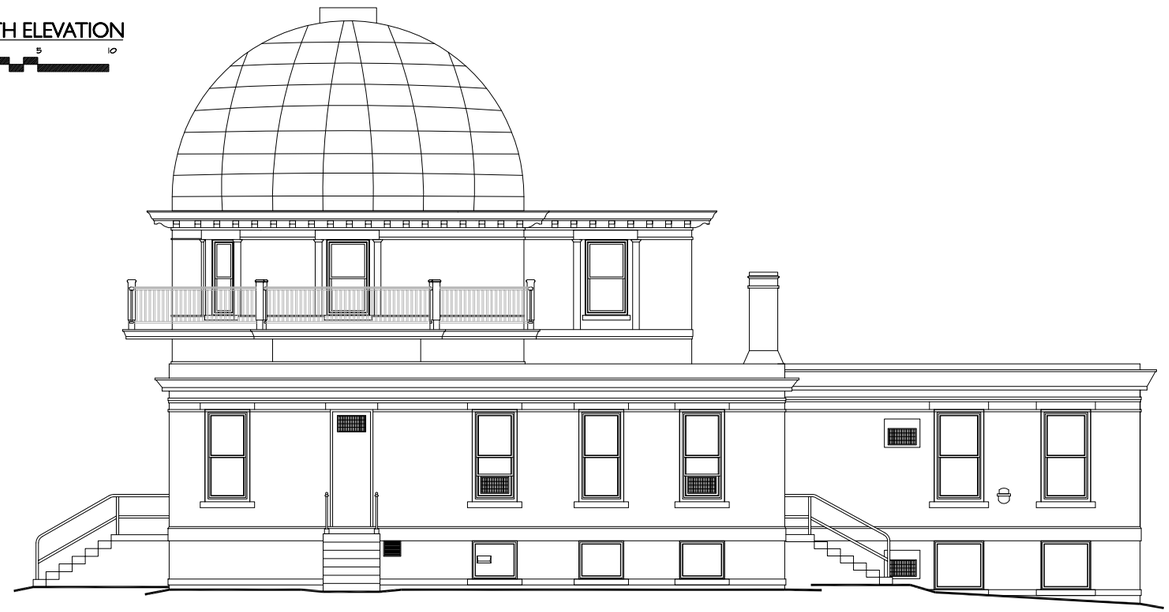


6 EXISTING SOUTH ELEVATION
1/4" = 1'-0"
0 1 5 10



7 EXISTING WEST ELEVATION
1/4" = 1'-0"
0 1 5 10

NAME AND LOCATION OF STRUCTURE:
ASTRONOMICAL OBSERVATORY
FEASIBILITY STUDY - EXISTING
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FILE NAME: U14117 Feasibilty
FLOOR: ELEVATIONS
DATE PRINTED: 26 Mar 2015
SHEET. # A - 6

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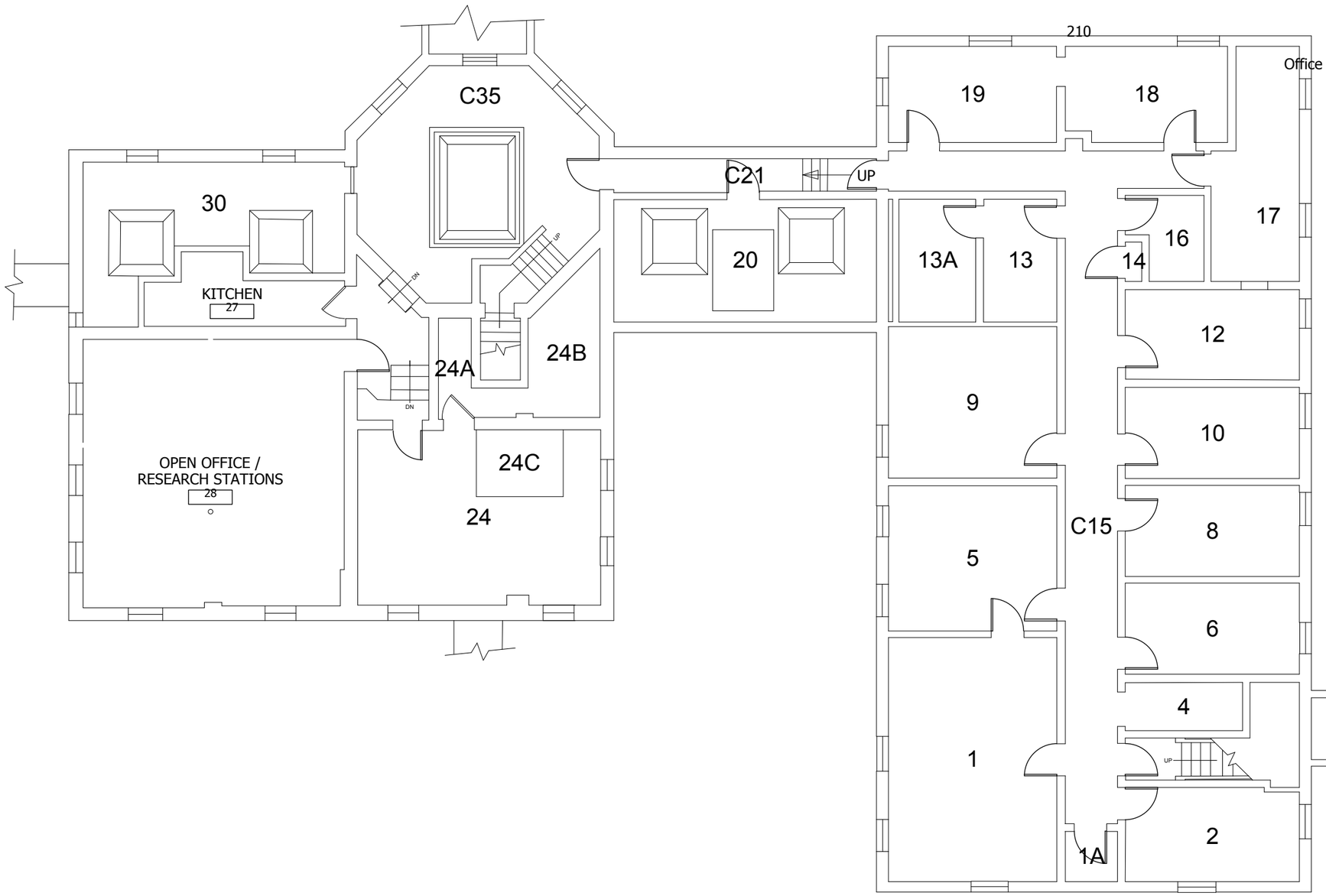

2 OPTION 1&2 BASEMENT PLAN
3/32" = 1'-0"

FLOOR: Option 1 Basement
SHEET. # A-7
FILE NAME: U14117 Feasibilty
DATE PRINTED: 30 Jun 2015

NAME AND LOCATION OF STRUCTURE:
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EXISTING STEPS

DN

1
2.0

NEW WINDOW

C135

NEW SKYLIGHTS

C120

118

117

116

WOMENS

113

114

ST
AI
RS
DN
RA
MP
DN

MULTI-PURPOSE ROOM
129

MENS
126

UP

123

DN

MUSEUM
121

MENS
111

112

2
2.0

6
2.1

109

110

C100

THERMALLY ISOLATED SPACE

ADA/UNI TOILET
124A

4
2.1

107

108

CEILING MTD. PROJECTOR

PROJECTION SCREEN

STORAGE
124

WOMEN
124b

5
2.1

ADA RAMP

NEW PORCH

105

106

NEW EXTERIOR ACCESSIBLE LIFT

3
2.1

DEFENSIVE PLANTINGS AT ALL WINDOWS AT GRADE AROUND BUILDING PERIMETER - TYP.

UP

LANDING ABOVE

103

UP

DN

102A

DN

TABLES AND CHAIRS

NEW LANDSCAPE

101

102

EXISTING TREES TO REMAIN

NEW WROUGHT IRON FENCE AND MASONRY PIERS - TYP.

101B

NEW PERVIOUS PAVER AREA

NEW CONIFEROUS TREES

NEW CONCRETE WALK AND PAD

EXIS TING POD

EXIS TING POD

EXIS TING POD

MORROW PLOTS

1 OPTION 1 FIRST FLOOR PLAN
3/32" = 1'-0"

FILE NAME: U14117 Feasibilty
FLOOR: Option 1 First
DATE PRINTED: 30 Jun 2015
SHEET. # A-8

NAME AND LOCATION OF STRUCTURE:
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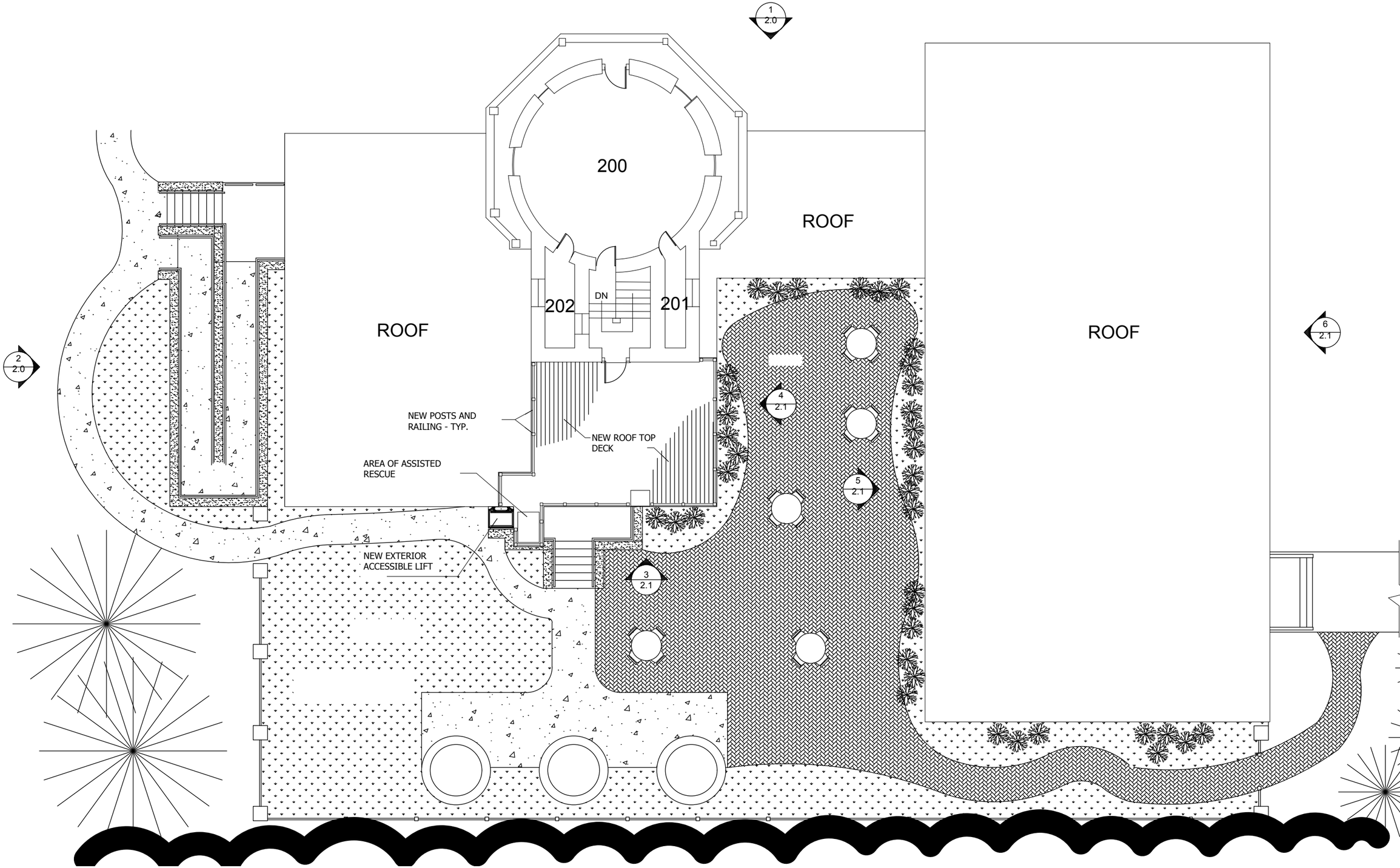

1 OPTION 1&2 ROOF PLAN
3/32" = 1'-0"

NAME AND LOCATION OF STRUCTURE:
ASTRONOMICAL OBSERVATORY
FEASIBILITY STUDY - Proposed
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FILE NAME: U14117 Feasibility
DATE PRINTED: 30 Jun 2015
FLOOR: Option 1 Roof
SHEET. # A-9

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EXISTING STEPS
DN
1 2.0
NEW WINDOW
C135
NEW SKYLIGHTS
C120
OFFICE 118
OFFICE 117
OFFICE 116
WOMENS 113
MENS 111
MUSEUM 121
ST AI RS DN RA MP DN
MULTI-PURPOSE ROOM 129
MENS 126
UP
123
DN
2 2.0
6 2.1
THERMALLY ISOLATED SPACE
ADA/UNI TOILET 124A
4 2.1
RESEARCH LIBRARY AND GALLERY 110
CEILING MTD. PROJECTOR
PROJECTION SCREEN
STORAGE 124
WOMEN 124b
5 2.1
ADA RAMP
NEW PORCH
NEW EXTERIOR ACCESSIBLE LIFT
DEFENSIVE PLANTINGS AT ALL WINDOWS AT GRADE AROUND BUILDING PERIMETER - TYP.
3 2.1
LANDING ABOVE
TABLES AND CHAIRS
UP
DN
102A
DN
NEW LANDSCAPE
OFFICE 101
101B
OFFICE 102
EXISTING TREES TO REMAIN
NEW WROUGHT IRON FENCE AND MASONRY PIERS - TYP.
NEW PERVIOUS PAVER AREA
NEW CONIFEROUS TREES
NEW CONCRETE WALK AND PAD
EXIS TING POD
EXIS TING POD
EXIS TING POD
MORROW PLOTS

1 OPTION 2 FIRST FLOOR PLAN
3/32" = 1'-0"

FILE NAME: U14117 Feasibility
FLOOR: Option 2 First
DATE PRINTED: 30 Jun 2015
SHEET. # A-10

NAME AND LOCATION OF STRUCTURE:
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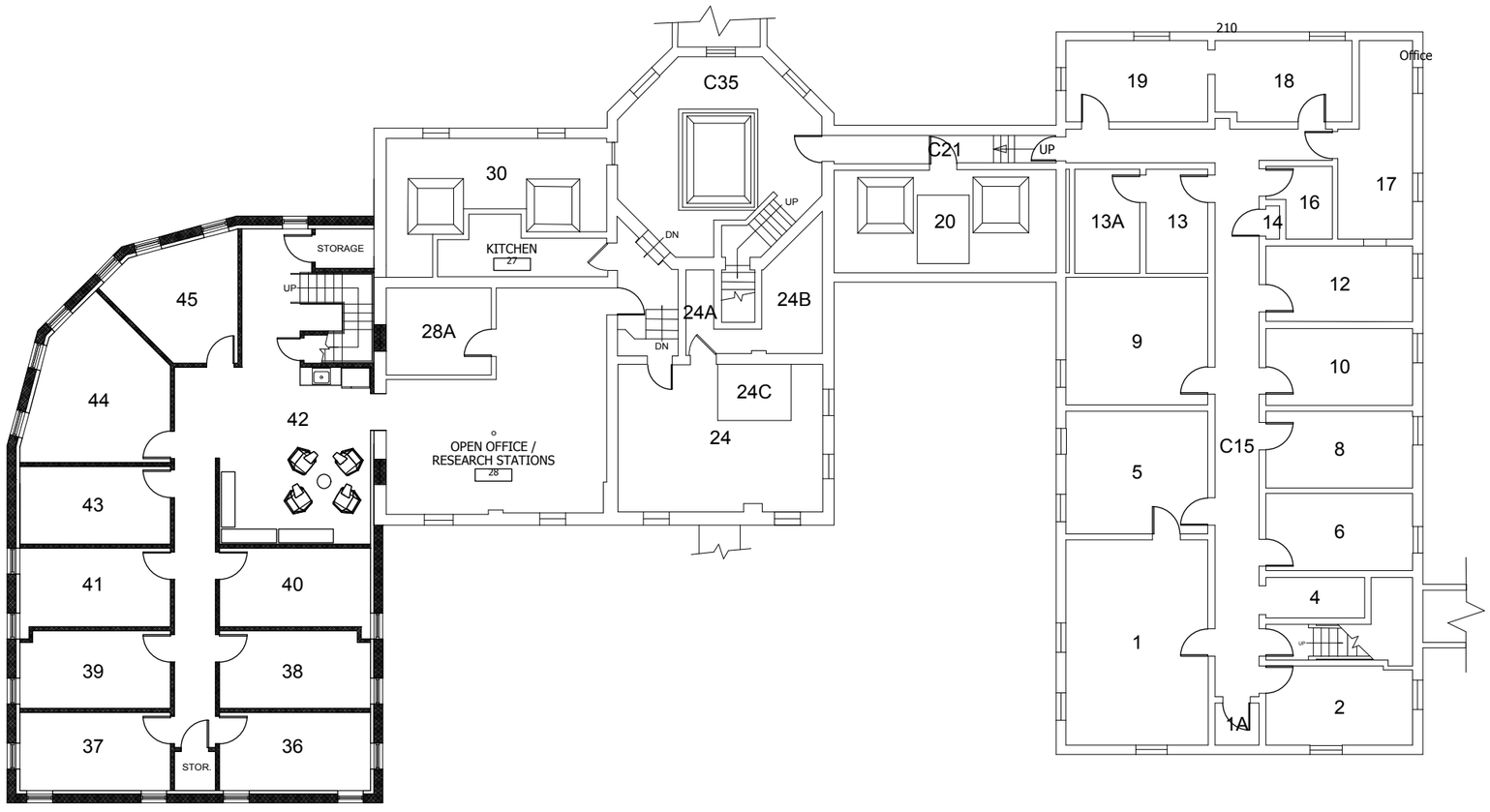

1 OPTION 3 BASEMENT PLAN
1/16" = 1'-0"

FILE NAME: U14117 Feasibilty
FLOOR: Option 3 Basement
DATE PRINTED: 30 Jun 2015
SHEET. # A-11

NAME AND LOCATION OF STRUCTURE:
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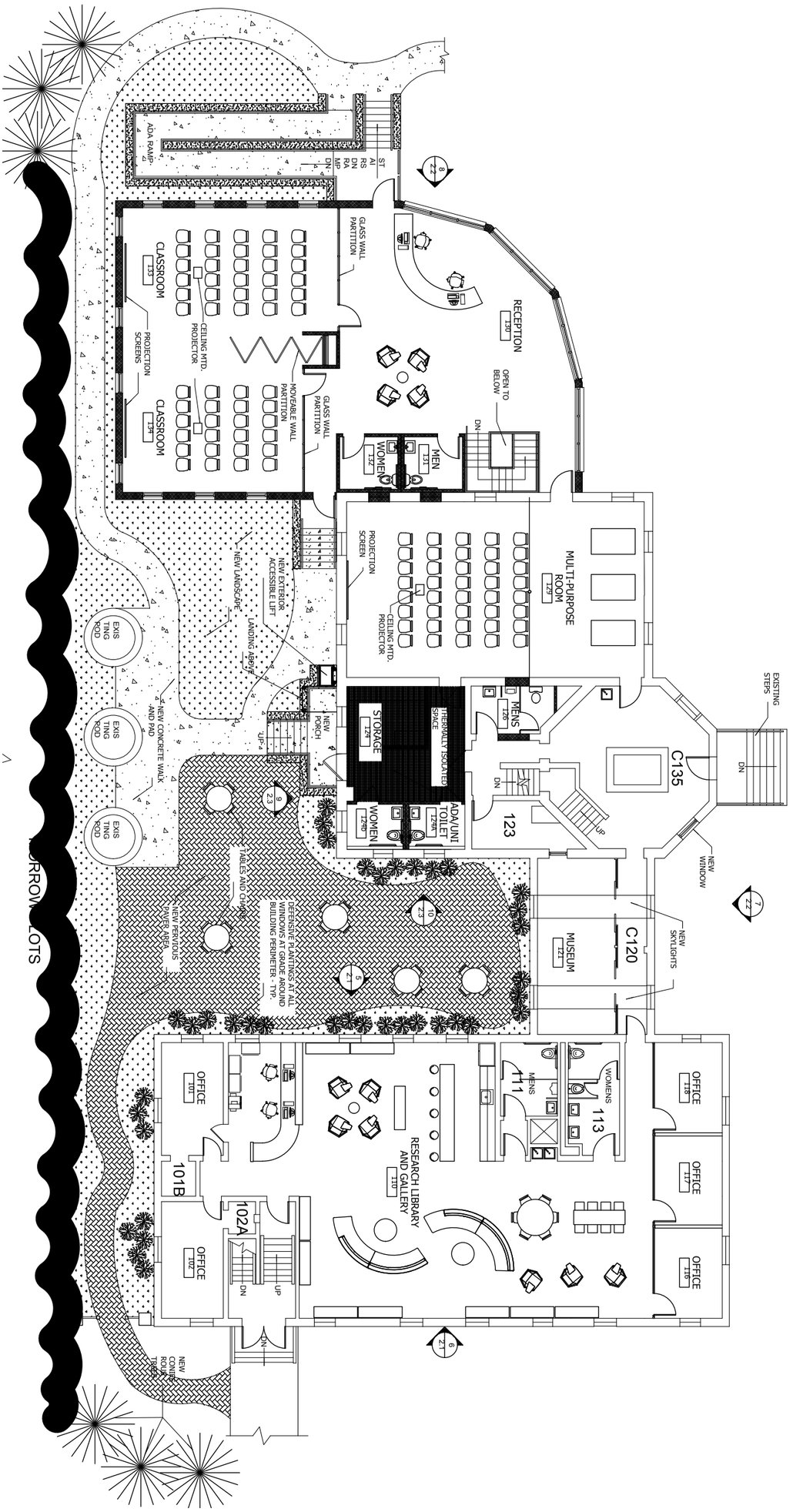

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NAME AND LOCATION OF STRUCTURE:

ASTRONOMICAL OBSERVATORY FEASIBILITY STUDY - Proposed

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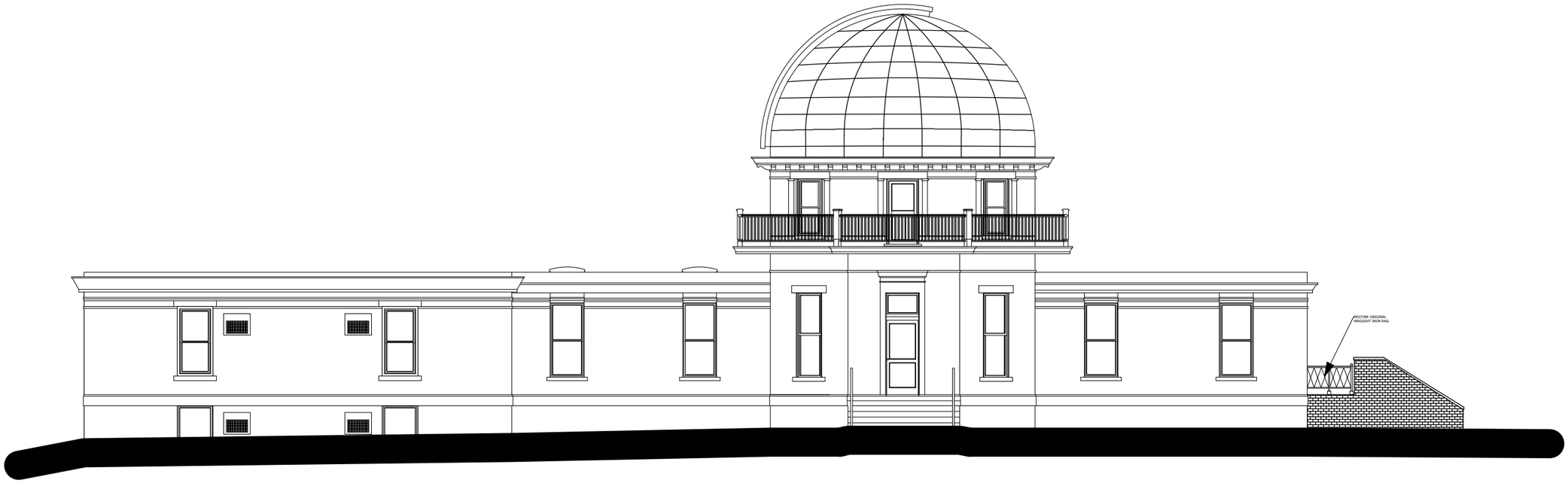
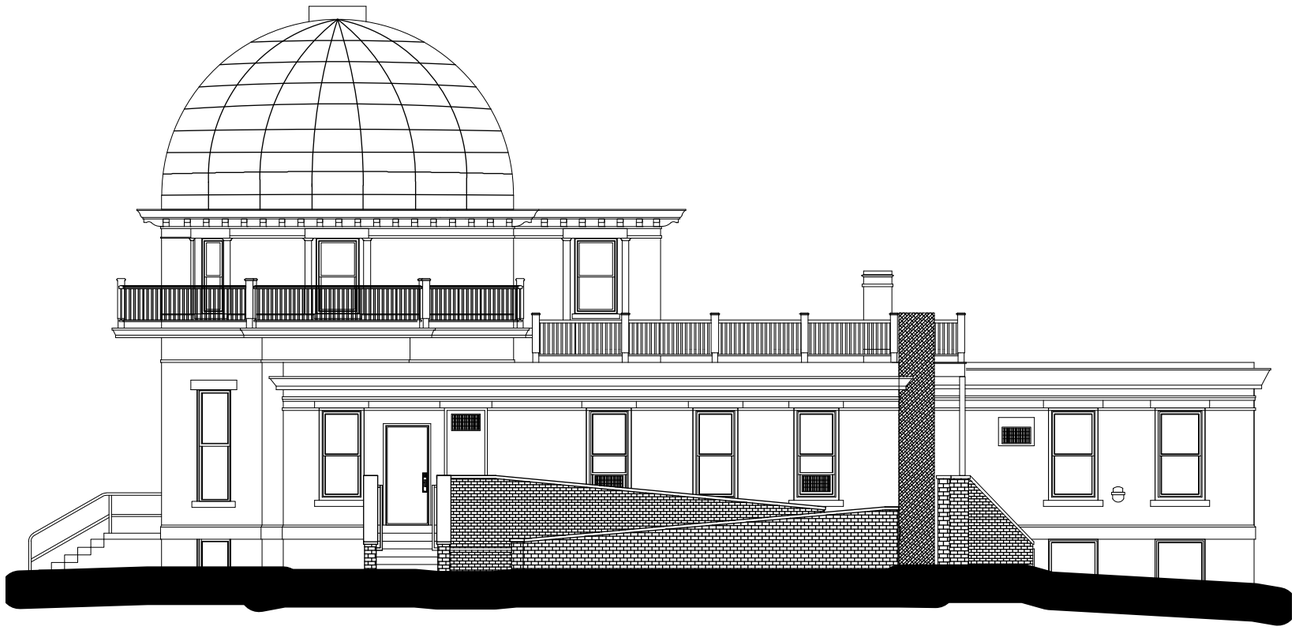
FILE NAME:	FLOOR:
U14117 Feasibilty	Option 3 First
DATE PRINTED:	SHEET. #
30 Jun 2015	A-12



1 OPTION 1&2 NORTH ELEVATION
3/32" = 1'-0"



2 OPTION 1&2 WEST ELEVATION
3/32" = 1'-0"

FLOOR: Option 3 Elevs
SHEET. # A-13

FILE NAME: U14117 Feasibilty
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NAME AND LOCATION OF STRUCTURE:
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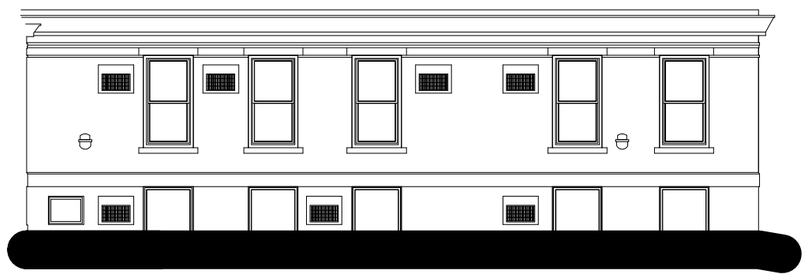
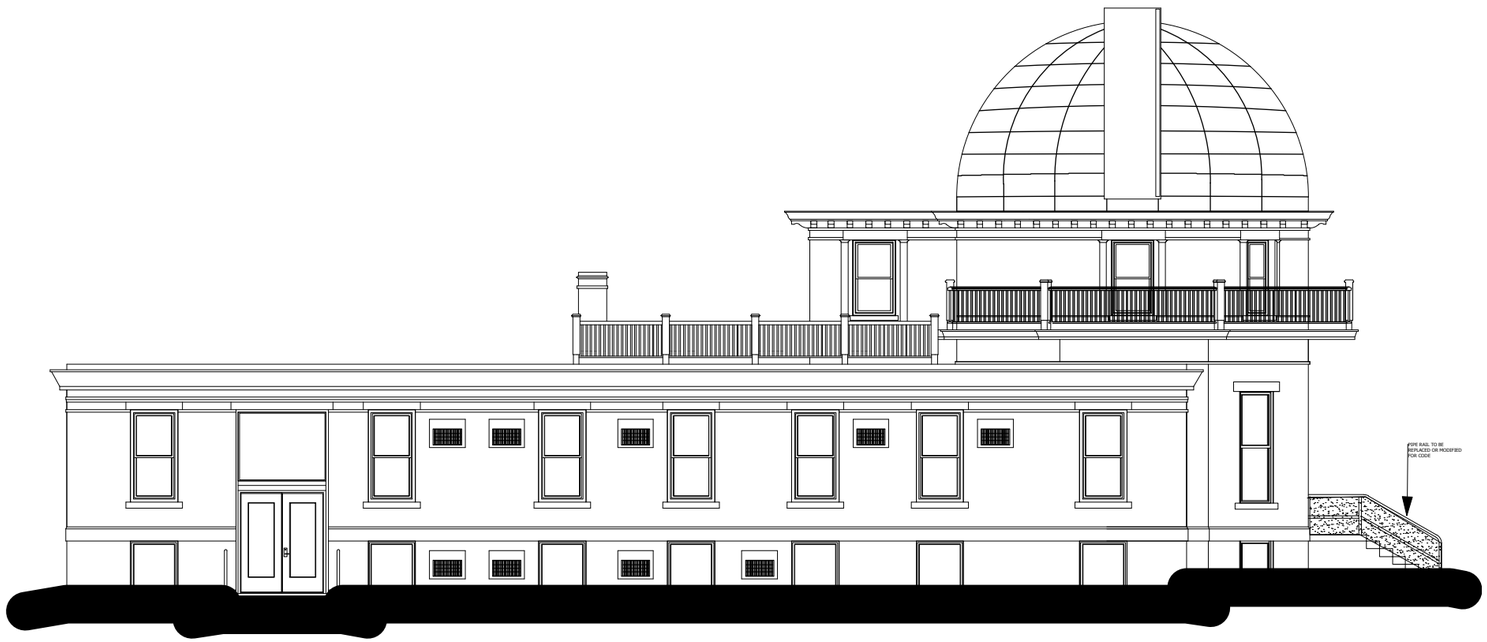
3 OPTION 1&2 SOUTH ELEVATION
3/32" = 1'-0"



4 OPTION 1&2 PARTIAL WEST ELEVATION
3/32" = 1'-0"



5 OPTION 1&2 EAST ELEVATION
3/32" = 1'-0"

NAME AND LOCATION OF STRUCTURE:
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FEASIBILITY STUDY - Proposed
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FILE NAME: U14117 Feasibilty
DATE PRINTED: 30 Jun 2015
FLOOR: Option 3 ELEVS
SHEET: # A-14

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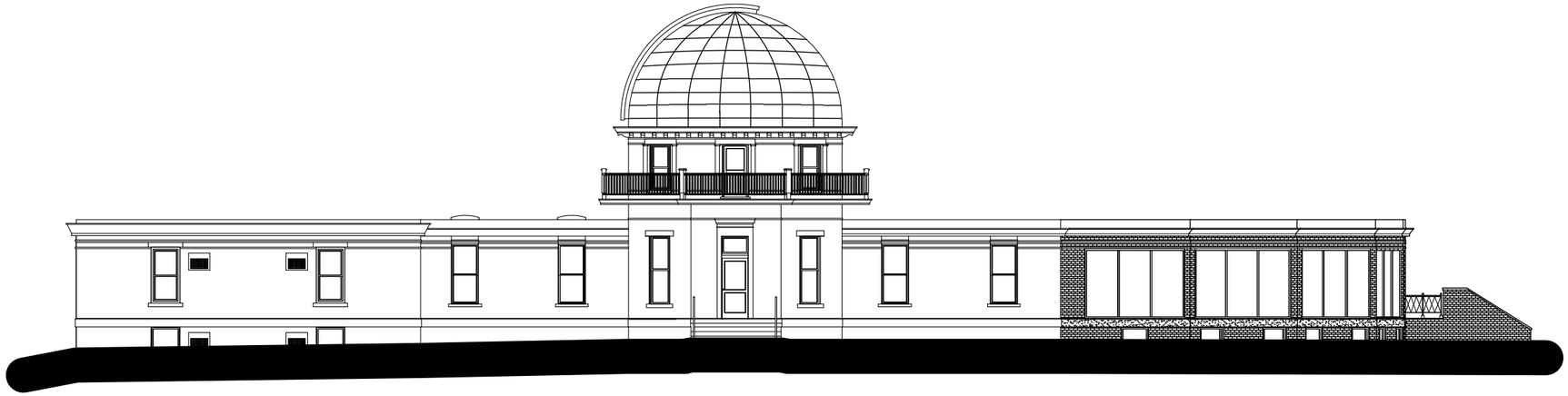
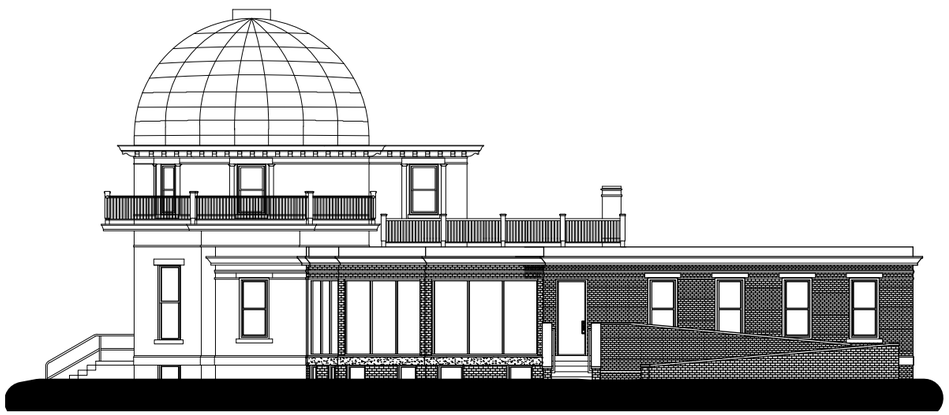


6 OPTION 3 NORTH ELEVATION
1/16" = 1'-0"



7 OPTION 3 WEST ELEVATION
1/16" = 1'-0"

NAME AND LOCATION OF STRUCTURE:
ASTRONOMICAL OBSERVATORY
FEASIBILITY STUDY - Proposed
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FLOOR: Option 3 ELEVS
SHEET. # A-15
FILE NAME: U14117 Feasibilty
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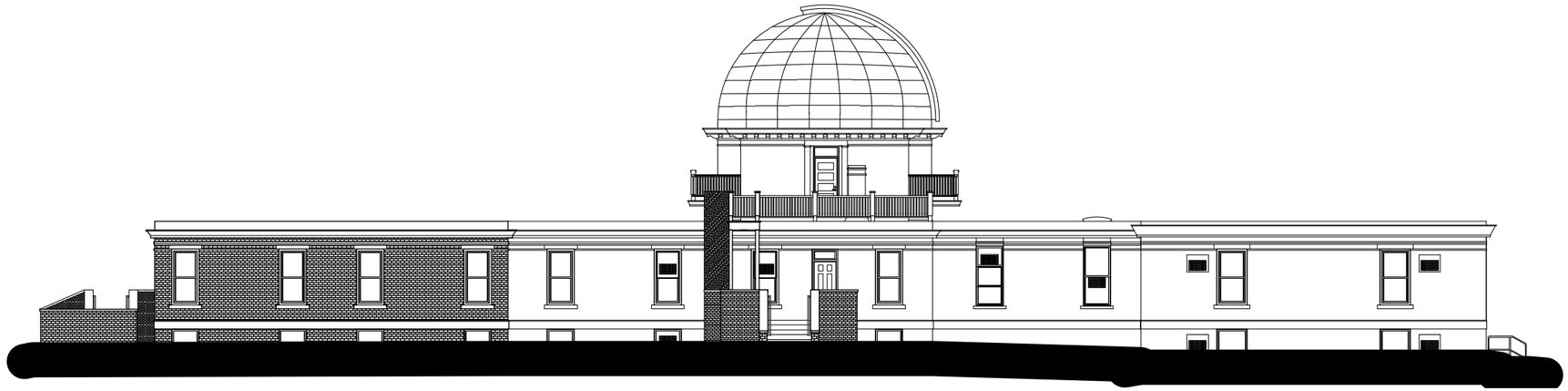
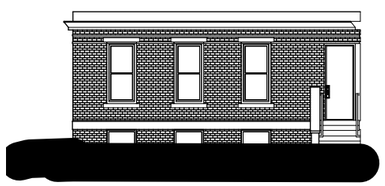


8 OPTION 3 SOUTH ELEVATION
1/16" = 1'-0"



9 OPTION 3 PARTIAL EAST ELEVATION
1/16" = 1'-0"

NAME AND LOCATION OF STRUCTURE:
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FEASIBILITY STUDY - Proposed
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FILE NAME: U14117 Feasibilty
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