

The following Motions and Documents were considered by the GFC Facilities Development Committee at its November 22, 2012 meeting:

Agenda Title: **Dentistry/Pharmacy Building Shell and Core Redevelopment – Schematic Design**

APPROVED MOTION: THAT the GFC Facilities Development Committee approve, under delegated authority from General Faculties Council and on the recommendation of Operations and Maintenance, the proposed Dentistry/ Pharmacy Building Shell and Core Redevelopment – Schematic Design (as set forth in Attachment 2) as the basis for further planning.

Final Item: [4](#)

Agenda Title: **GFC Facilities and Development Committee Learning Spaces Subcommittee Report**

APPROVED MOTION: THAT the GFC Facilities Development Committee endorse and forward the GFC FDC Learning Spaces Subcommittee (FDC LSS) Final Report to the Offices of the Provost and Vice-President (Academic) and Vice-President (Facilities and Operations) with a request for these Offices to use this report as the basis for guiding future learning space planning.

Final Item: [5](#)

OUTLINE OF ISSUE

 Agenda Title: **Dentistry/Pharmacy Building Shell and Core Redevelopment– Schematic Design**

Motion: THAT the GFC Facilities Development Committee approve, under delegated authority from General Faculties Council and on the recommendation of Operations and Maintenance, the proposed Dentistry/ Pharmacy Building Shell and Core Redevelopment – Schematic Design (as set forth in Attachment 2) as the basis for further planning.

Item

Action Requested	<input checked="" type="checkbox"/> Approval <input type="checkbox"/> Recommendation <input type="checkbox"/> Discussion/Advice <input type="checkbox"/> Information
Proposed by	Ben Louie, University Architect, Facilities and Operations
Presenter	Ben Louie, University Architect, Facilities and Operations Hugh Warren, Executive Director, Operations and Maintenance, Facilities and Operations Len Rodrigues, Senior Principal, Stantec Architecture Ltd.
Subject	Dentistry/Pharmacy Building Shell and Core Redevelopment

Details

Responsibility	Don Hickey, Vice President, Facilities and Operations
The Purpose of the Proposal is (please be specific)	To bring forward as an approval item, the Dentistry/Pharmacy Building Shell and Core Redevelopment – Schematic Design
The Impact of the Proposal is	Renewal and Repurpose of aged facility that currently has limited functionality and high deferred maintenance.
Replaces/Revises (eg, policies, resolutions)	n/a
Timeline/Implementation Date	The project schedule has the design development report completed in early 2013. Project is currently on University's top capital priority list and is awaiting funding for work to proceed past Design Development.
Estimated Cost	N/A
Sources of Funding	N/A
Notes	Future related reports to come forward to the GFC Facilities Development Committee in early 2013: <ul style="list-style-type: none"> • Functional Program (for Approval) – TBD (02/2013); • Shell and Core - Design Development (for Approval) – TBD (04/2013)

Alignment/Compliance

Alignment with Guiding Documents	Academic Plan, Long Range Development Plan, Deferred Maintenance Master Plan, Comprehensive Institutional Plan
Compliance with Legislation, Policy and/or Procedure Relevant to the Proposal (please quote legislation and include identifying section numbers)	Post-Secondary Learning Act (PSLA): The PSLA gives GFC responsibility, subject to the authority of the Board of Governors, over academic affairs (Section 26(1)) and provides that GFC may make recommendations to the Board of Governors on a building program and related matters (Section 26(1) (o)). Section 18(1) of the PSLA give the Board of Governors the authority to make any bylaws “appropriate for the management, government and control of the university buildings and land.” Section 19 of the Act requires that the Board “consider the recommendations of the general faculties council, if any, on matters of academic import prior to providing for (a) the support and maintenance of the university, (b) the betterment of existing buildings, (c) the construction of any new buildings the board considers necessary for the purposes of the university [and] (d) the furnishing and equipping of the

Approved Item No. 4

	<p>existing and newly erected buildings [.] [...]” Section 67(1) of the Act governs the terms under which university land may be leased.</p> <p>2. GFC Facilities Development Committee (FDC) Terms of Reference – Section 3. Mandate of the Committee: “[...]”</p> <p>2. Delegation of Authority</p> <p>Notwithstanding anything to the contrary in the terms of reference above, the Board of Governors and General Faculties Council have delegated to the Facilities Development Committee the following powers and authority:</p> <p>A. Facilities</p> <ol style="list-style-type: none"> 1. To approve proposed General Space Programmes (Programs) for academic units. 2. (i) To approve proposals concerning the design and use of all new facilities and the repurposing of existing facilities and to routinely report these decisions for information to the Board of Governors. <ul style="list-style-type: none"> (ii) In considering such proposals, GFC FDC may provide advice, upon request, to the Provost and Vice-President (Academic), Vice-President (Facilities and Operations), and/or the University Architect (or their respective delegates) on the siting of such facilities. (GFC SEP 29 2003) <p>B. Other Matters</p> <p>The Chair of FDC will bring forward to FDC items where the Office of the Provost and Vice-President (Academic) and/or the Office of the Vice-President (Facilities and Operations), in consultation with other units or officers of the University, is seeking the advice of the Committee.</p> <p>3. UAPPOL Space Management Policy and Space Management Procedure: The respective roles of GFC FDC and the Vice-President (Facilities and Operations) with regard to institutional space management are set out in this Board-approved Policy and attendant Procedure.</p> <ul style="list-style-type: none"> • To access this policy suite on line, go to: www.uappol.ualberta.ca .
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Routing (Include meeting dates)

Consultative Route (parties who have seen the proposal and in what capacity)	<ul style="list-style-type: none"> • Visioning Session 1 – President’s Executive Committee-Operations, Committee Members(originally EPC) – May 9, 2012 • Visioning Session 2 – President’s Executive Committee-Operations, Committee Members – August 30, 2012 • Enterprise and Advanced Education – September 13, 2012 • Schematic Design Report – GFC Facilities Development Committee (For Discussion) – October 25, 2012
Approval Route (Governance) (including meeting dates)	<ul style="list-style-type: none"> • Shell and Core - Schematic Design – GFC Facilities Development Committee (For Approval) – November 22, 2012
Final Approver	GFC Facilities Development Committee (November 22, 2012)

Attachments:

1. Attachment 1 (Pages 1-3): Briefing Note - Dentistry/Pharmacy Building Redevelopment (October 31, 2012)



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2. Attachment 2 (Pages 1-259) - Draft Copy of the Dentistry/Pharmacy Building Redevelopment "Schematic Design Report" (October 5, 2012). *Note: report made electronically available to the FDC membership for early review, in advance of the November 22, 2012 business meeting of GFC FDC.*

Prepared by:

Hugh Warren (Executive Director, Operations and Maintenance) - hugh.warren@ualberta.ca

Revised: 11/27/2012

Dentistry Pharmacy Building Redevelopment

Background

With the completion of Edmonton Clinic Health Academy and the move of faculty units to new space, large portions of the Dentistry Pharmacy building have become vacant. This has presented an opportunity to renew and repurpose the full facility. Requests for funding assistance were made to the Government and sufficient funding was obtained to allow the initial phase of the project. This phase was to be based on a concept of redevelopment design on the basis of a shell and core project development to the design development (DD) phase. The shell and core design project has proceeded in advance of interior programming which will be carried out through the Office of the University Architect beginning in 2012 and through 2013.

The original building was constructed in 1922 and wings were added in 1946, 1947, 1951 and 1958 with a combined total gross area of 30,584 square meters.

As preparation for the redevelopment project two visioning sessions have been held with PEC-O; one on May 9, 2012 and one on June 13, 2012. These sessions were to set steering committee goals and guidelines for the project. The visioning sessions set clear goals for:

1. A Town Hall in support of the workings of a participatory University Community, including the Council Chamber and various conference/meeting rooms – an active face of the University, a symbol of architectural style iconography, both exterior and interior, that reference Age of Reason/Humanism & Liberal Education), repository of memories and history of the institution.
2. The Executive offices to be centrally located and under one roof to effectively deliver academic plan.
3. A Venue to celebrate academic mission, people and excellence – recognition events, exhibitions, symposium opening/closing, plaques and other activities to celebrate the University community, its various programs, discoveries, achievements and laureates – brand development.
4. The Welcome Centre to promote the “present” vibrant institution and for recruitment activities students, faculties and staff as well as supporting on-going retention goals – welcoming spirit, recruitment and retention of students.
5. A Hub for networking and development of social capital: to engage alumni, members of the Board and Senate, government officials, business leaders, donors, visitors and guests who engage actively with the University – relations building, lobbying, networking and fundraising.

Dentistry Pharmacy Building Redevelopment

Rather than a historic conservation project, this project has been approached as a renewal and redevelopment of a significant building on campus that the University would define the areas and features of the building that would be brought forward for preservation and as special functional / celebration areas.

The development of design for shell and core will take the project to the following levels of completion for Design Development:

1. Architectural / Structural / Building Envelope – all interior and exterior building elements would be addressed to the point to allow for shelling of interior floor spaces for future fit out. This also includes design resolution for vertical conveyance, conversion of court yards to interior space, dealing with the Slowpoke, LRT entrance relocation, building code reviews and reconciliations, floor loading to use and exiting requirements.
2. Mechanical - would have design complete for central utilities, all central systems in place, ventilation distribution to but not on individual floors and perimeter heating and cooling.
3. Electrical – would have the design complete for all central utility, all building central systems in place and distribution to the individual floors (floor panels, raceways, data closets etc.).

The project schedule has the design development report completed in early 2013.

Issues

Given the significance to campus of the Dentistry Pharmacy facility, the size of the project, the complexity of the renewal of an aged building and the merging of new and old systems, it is important that FDC has sufficient time to review and comment on the schematic design report. To accommodate this Facilities and Operations will return for comments and approval at the November FDC session.

Key points for review of project documents provided include:

1. The facility will be re-purposed as the central administrative facility for campus.
2. The project incorporates the use of modern elements and materials with historic building elements.
3. Universal accessibility change to the front entrance to allow grade level access to the atrium from the south side.
4. Use and function of the new atrium has to address the needs for 90% of the year.
5. The relationship of the north face of Dentistry Pharmacy facility to the future redevelopment of the North Power Plant.
6. Look of the new atrium and tie back to the existing building.

Dentistry Pharmacy Building Redevelopment

7. New plaza on the south face that changes the profile for the LRT exit /entrance and minimizes its impact on the look of the facility
8. Preservation and special areas and their use for binding the history of the University into the facility
9. The project has developed sufficiently to have defined 5 phases of construction.

Constraints and Challenges Still Under review

1. The final resolution and approval for the Slowpoke research space will require input from the Canadian Nuclear Safety Commission. This may impact the option preferred for this area.
2. An adjacency impact identifying the need to review the South Academic Building Link has been identified and the scope needs to be defined
3. The final resolution of the LRT entrance / exit needs to be developed as part of the overall campus plan taking into account the future demolition of the administration building, quad redevelopment and new landscape plan for the south face of the Dentistry Pharmacy facility.
4. The building stacking plan process has commenced and is anticipated to be available for review in summer 2013.

Recommendation

THAT the GFC Facilities Development Committee approve, under delegated authority from General Faculties Council and on the recommendation of Operations and Maintenance, the proposed schematic design of the Dentistry Pharmacy Building Redevelopment that was issued for review and comment be approved to proceed to design development with consideration for incorporation of comments.



Dentistry Pharmacy
Building Redevelopment

Schematic Design Report

DRAFT - October 5, 2012





Acknowledgements

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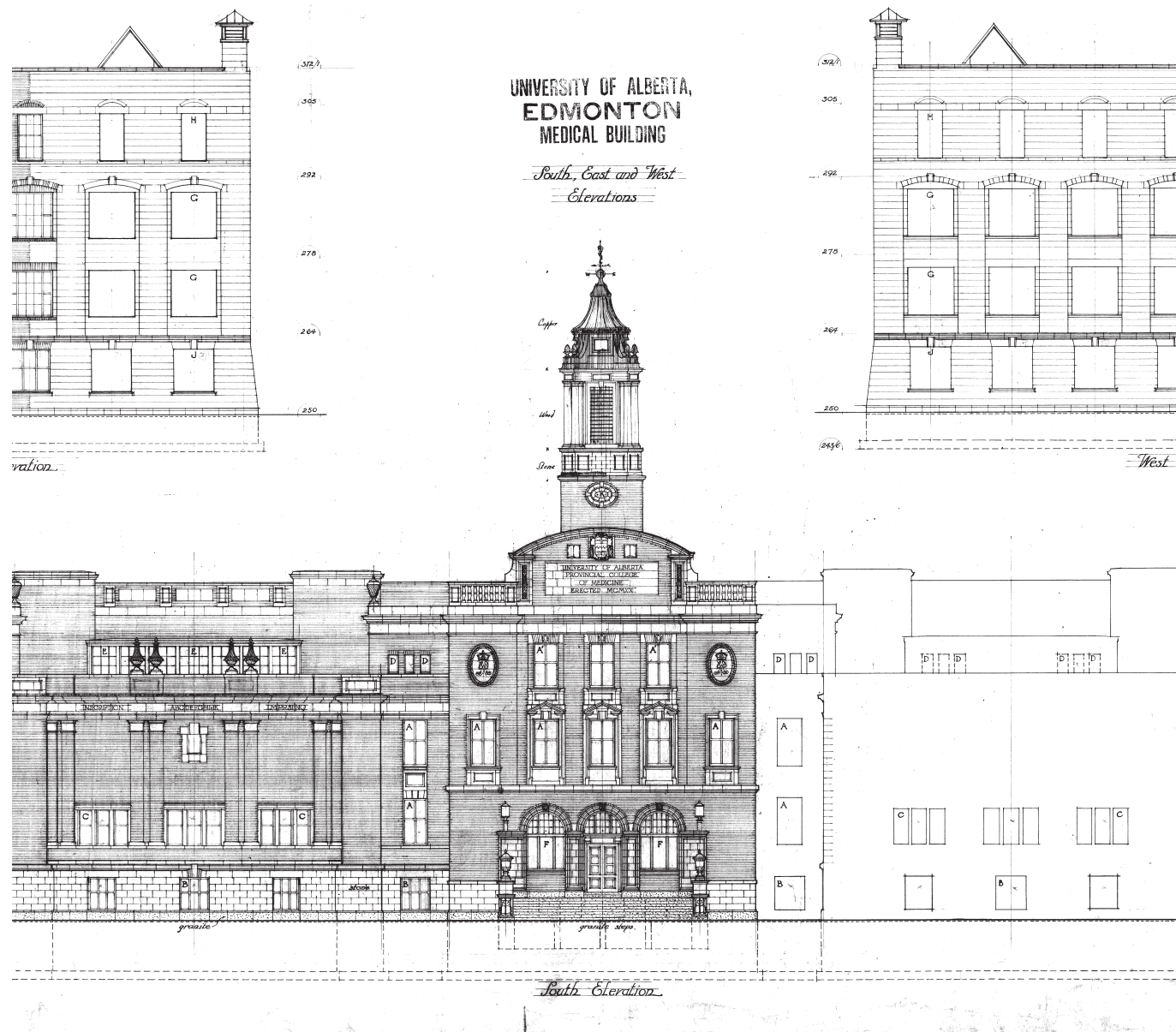
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Although a core and shell project, the ability of the renovated building to support the future users cannot be ignored in the design. Besides the overriding goals of the project the space developed needs to accommodate the proposed occupants of the building. It is clear from preliminary order of magnitude space projections that there is larger demand for space than the building can provide. Expanding the possible program area within the atrium has reduced the short fall but the demand still exceeds the building area. The development of multiuse space and the use of innovative programming could allow a greater placement of occupants in the building.



- *Selective Demolition*
- *Building Envelope*
- *SLOWPOKE Plan*
- *Building Code Analysis, Egress and Fire Protection*



SELECTIVE DEMOLITION

As part of the project risk mitigation plan a better understanding of existing conditions was needed. The following were investigated during schematic design to reduce possible negative impact at construction to the design or budget. Investigation and review of the building can allow the unknowns to become knowns. The Selective Demolition drawings are in Appendix A.

BUILDING ENVELOPE

Further review of the building envelope has taken place during the schematic design phase. The product of that is our Building Envelope Report - Schematic Design - October 5, 2012.

The report confirms the direction that is being taken with respect to the 1922, 1946, 1947, and 1958 Buildings. The report will be finalized during Design Development and will include construction detailing and final decisions on providing wall insulation to the 1958 Building, treatment of the chimneys and spire, brick jointing, and interface with the atrium and penthouse new construction. The Building Envelope Report is Appendix B.

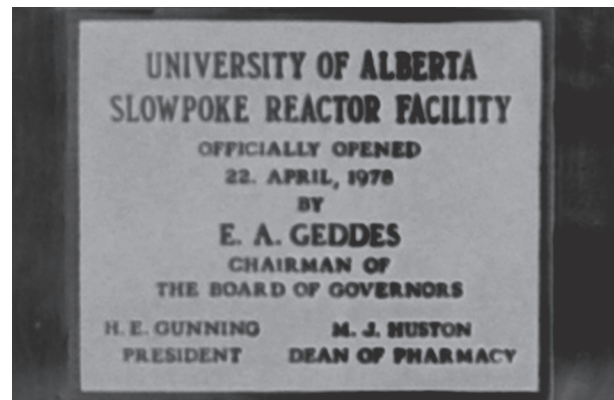
The results of our investigation of the existing envelope has brought us an understanding of the existing building that has helped define the design moving forward.

- plaster air barrier is being executed to interior of walls.
- new roofing complete with increased insulation is being provided to all existing roof areas.
- integration of new building envelope and existing envelope will provide an improved envelope.

SLOWPOKE PLAN

During schematic design the development of the plan to deal with the SLOWPOKE facility was completed and shows:

- a redefined SLOWPOKE facility at completion of the redevelopment of the Building.
- a relocation of SLOWPOKE office and support spaces into temporary space within Dentistry Pharmacy Building.
- a solution to isolate the SLOWPOKE facility from the remainder of the Dentistry Pharmacy Building during the construction phases.
- a solution to insolate the SLOWPOKE facility from the redeveloped building.
- a means of refueling or decommissioning the reactor after redevelopment of the building.
- temporary and permanent transportation routes for commercial isotope delivery.



This report will form the program for the work to prepare construction documents for the temporary office and support spaces and isolation of the facility during construction. Further investigation during design development and input from the SAB Link design will require an update of the report in design development. The SLOWPOKE Report is Appendix D.

The ongoing retention of the SLOWPOKE Facility within the building has a significant impact on how the building is redeveloped. The decision that would allow for future expansion of the facility requires that the labs be relocated at the conclusion of the renovations but be kept in their present location through renovation. This impacts phasing, schedule, and final completion of the redevelopment.

2.3 SLOWPOKE Plan

BUILDING CODE ANALYSIS, EGRESS AND FIRE PROTECTION

The building code analysis that was begun in predesign was updated during schematic design. Direction in responding to the existing building and code concerns were identified by the design team and reviewed with the Authority Having Jurisdiction. The schematic design Code Analysis dated October 5, 2012 includes decisions agreed to by the Authority. The analysis will be completed during Design Development and will address the atrium exhaust, fire ratings, and sprinkler protection; final exiting; and final washroom count. The schematic design building code analysis is Appendix C.

The analysis of the building code that has taken place provided the design with a number of defining elements.

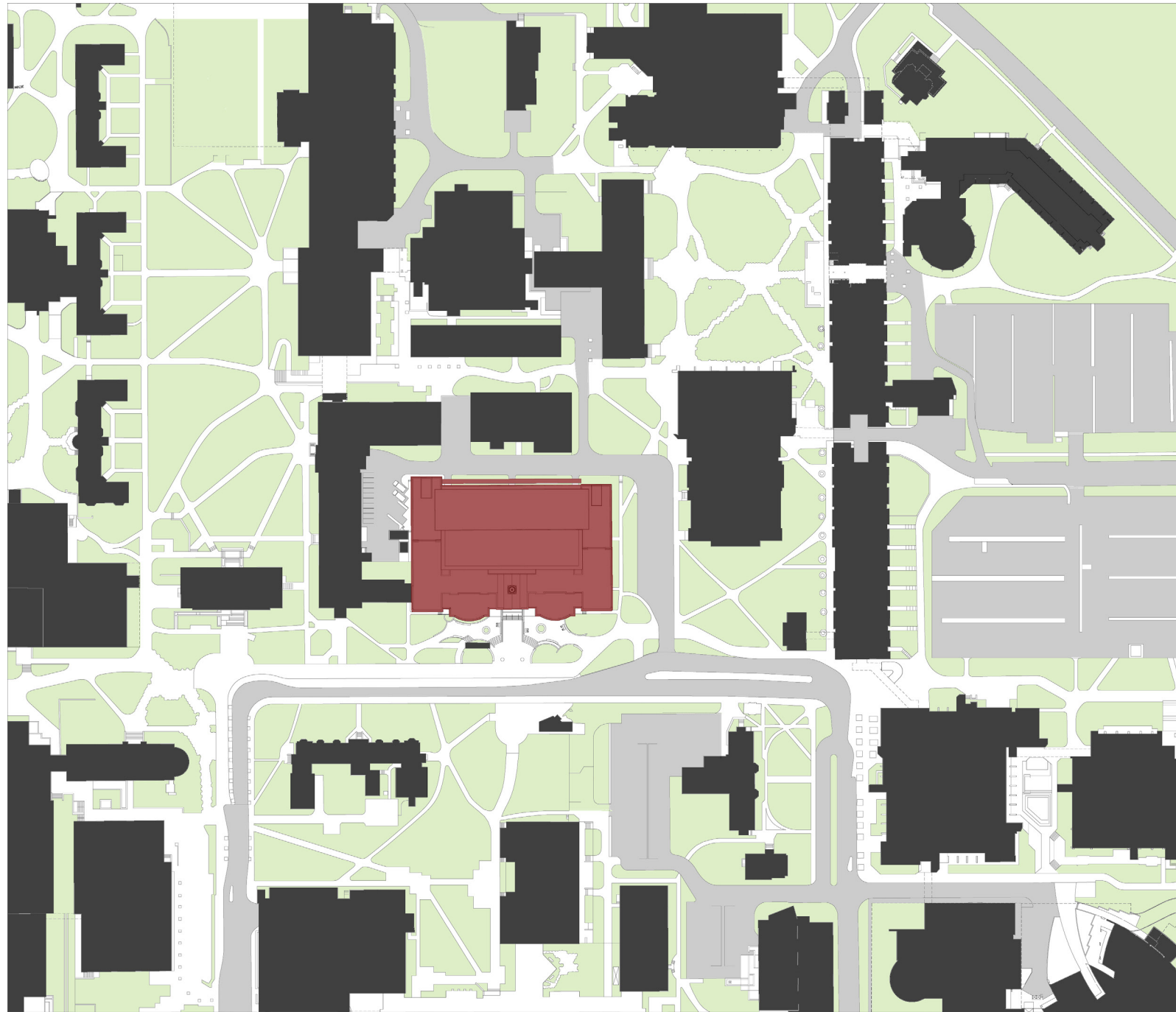
- building classification of the building as a seven storey building would have required two hour fire resistant ratings for floors and shafts, a much more difficult undertaking. Conversion of the seventh floor to mechanical allowed the building to be classified as a six storey building with one hour fire resistant ratings required as well as providing more programed space on the lower floors.
- providing barrier free (accessible) access to the building lead us to the creation of a special place below the lobby.
- the distribution of existing stairs within the building was found to support distributed exiting from each floor. The Authority Having Jurisdiction also allowed the older stairs to have their historic elements retained so that these stairs form part of the special places of the building.

2.4 Building Code





- *The “Stories”*
- *Opportunities*
- *Atrium Development*
- *Site*
- *Floor Plans*
- *Vertical Circulation*
- *Structural Configurations,
Capacities and Constrains*
- *Mechanical Systems*
- *Electrical Systems*
- *Acoustic Design*
- *Civil / Landscape*



The table below describes some of the potential stories that various people could experience at the redeveloped Dentistry Pharmacy Building.

	FISHERMAN (Who's recruiting?)	FISH (Who are you recruiting?)	HOOK (What's the attraction?)	WRIGGLING (Where does tour begin?)	NET (Where does tour end?)	BOAT (What's the desired outcome?)
1	VP ADVANCEMENT	ALUMNI	TRADITION = BRICK INNOVATION = GLASS	L2 ENTRANCE = HISTORY "I remember this place"	ATRIUM = GRAVITAS, "I can help shape a bright new future here"	DONATION \$\$
2	OFFICE OF THE REGISTRAR	PARENT	TRADITION = BRICK INNOVATION = GLASS	L2 ENTRANCE = HISTORY "My kid is part of larger story"	CAFE = COMFORT "Is this place right for you, kid?"	ENROLMENT OF STUDENT (Brain +\$)
3	DEAN	NEW GRAD STUDENT	INNOVATION = GLASS, WIRED TECHNOLOGY	L1 ATRIUM = COOL "Look at the cool stuff we do here"	ATRIUM EDGES = AWARD GALLERY "Your photo will be here"	ENROLMENT OF STUDENT (Brain +\$)
4	VP RESEARCH	P.I.	INNOVATION = GLASS	L1 ATRIUM = COOL "Look at the cool stuff we do here"	ATRIUM = GRAVITAS, "I can make a difference in this place"	RESEARCH \$\$ AND GRAD STUDENT TEAM
5	PRESIDENT	NEW VP	TRADITION = BRICK	L2 ENTRANCE = HISTORY "I will be part of this permanence"	ATRIUM = GRAVITAS, "I can help shape a bright new future here"	ACCEPT JOB
6	VP UNIVERSITY RELATIONS	COMMUNITY MEMBERS / LEADERS	TRADITION = BRICK	L2 ENTRANCE = PERMANENCE "So this is the UofA"	ATRIUM CENTER = VIBRANCY, "My community wants to work with this institution"	COLLABORATION

We thought it would be useful to walk the reader through one of the stories that the building supports to illustrate the approach that has been taken to its design.

The President of the University of Alberta is interested in attracting a particular individual to the University to serve in a new VP position that is being created. It is the early fall in Edmonton and the bright sunlight is being filtered through trees that have begun to change colour. The new VP was met at the airport by one of the President's staff and the route to the University was carefully selected to highlight the impact of the river valley on the experience of the City.



The car is brought around to the front of the new University Hall and there are banners along 89th Avenue marking the start of the new academic year. The president meets the car at the curb and welcomes her potential new Vice President.



THIS STONE WAS LAID
 THE HONORABLE
 ROBERT GEORGE BRETT MD LL.D.
 LIEUTENANT GOVERNOR OF ALBERTA
 SEPTEMBER 24TH 1920

3.1 The Stories - Arrival

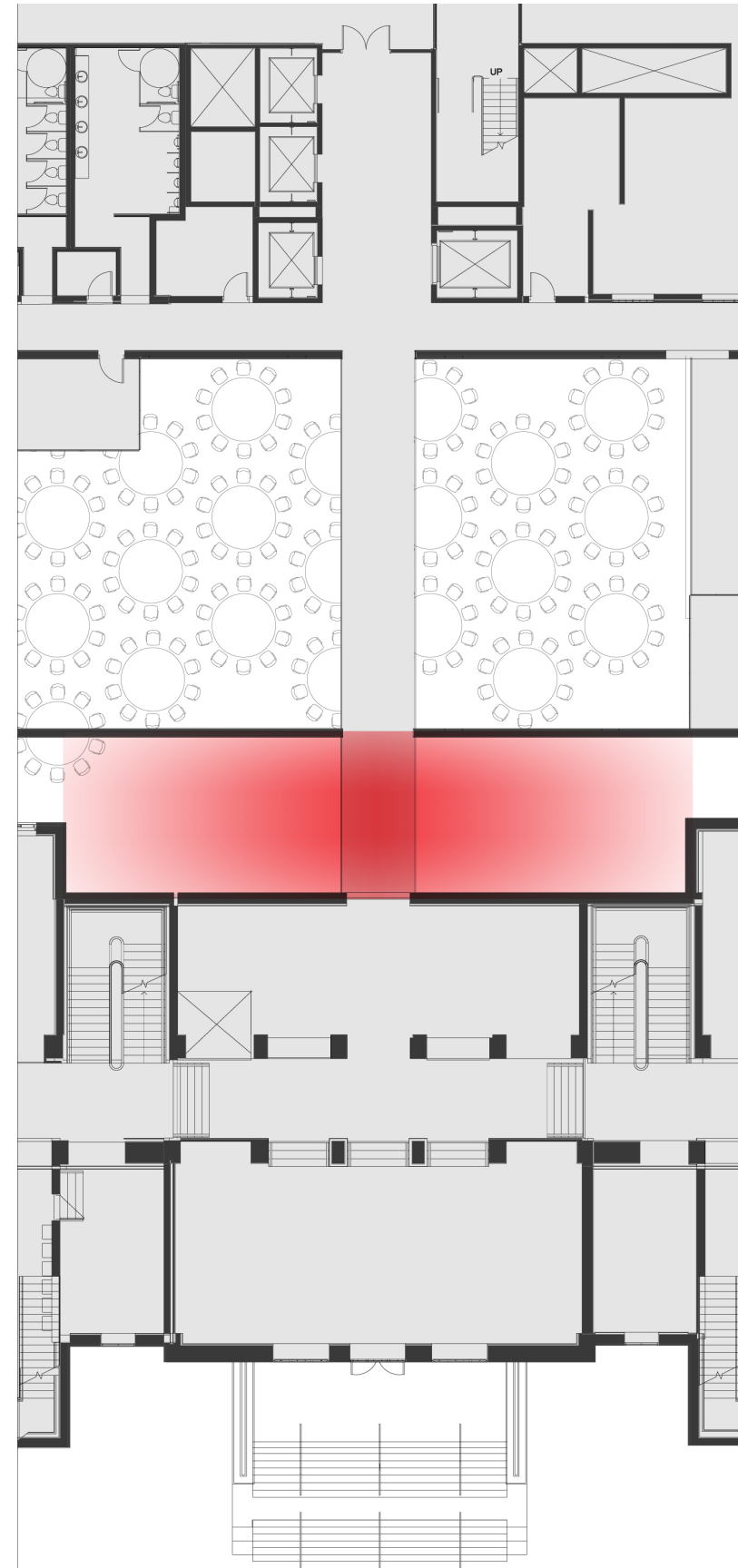


3. Design Concepts



They move toward the historical south face of the building and the small entourage ascends the stairs and enters the historic lobby restored to its original materials colours and lighting. The crests are all original celebrating the opening of the new Medical Building in 1922. They ascend another small stairway and make their way toward the opening that is on axis to the lobby. As they approach this opening, the President is explaining some of the history of the building and that the medical school now resides south of their present position in the complex of new buildings surrounding the hospital.

As they walk through the portal, they find themselves in a 2 storey space that celebrates the history of the University – its past presidents, Nobel Laureates, and academics with distinguished teaching and research careers. They view these displays from a slightly inclined bridge and they continue through another portal that reveals the full majesty of the inner courtyard. The atrium floor beneath them is alive with the activity of faculty staff and students going about their daily activities while around them, they can see into shared spaces that have meetings in progress.





A small gathering honoring the achievement of a Physics professor in undergraduate physics education is taking place in the upper level atrium around tables with wine and cheese.



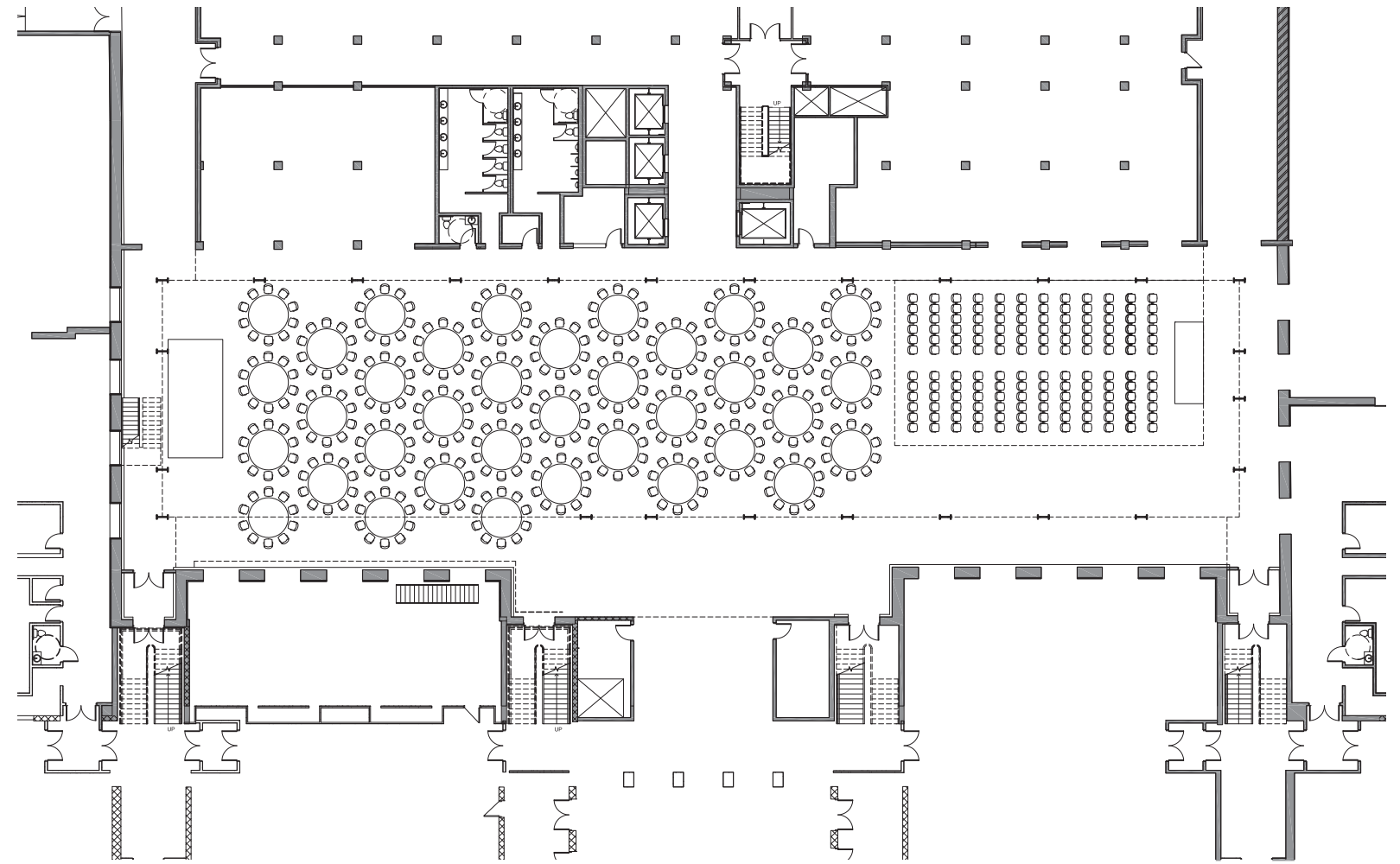
3. Design Concepts

3.1 The Stories - Transition from Historic to Modern





The President allows her guest to take in the events and then leads her to the elevators to ascend to the administrative level and her office on the 5th floor. She is ushered into the President's office and is offered a beverage as they move toward the winter garden and a couple of chairs to sit and discuss the possible posting to the University of Alberta further.



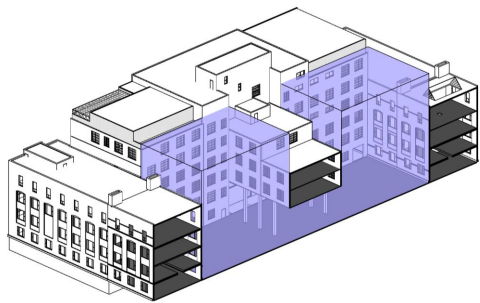
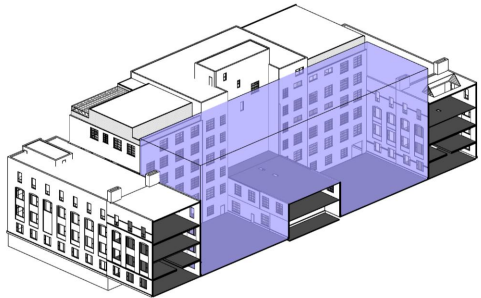
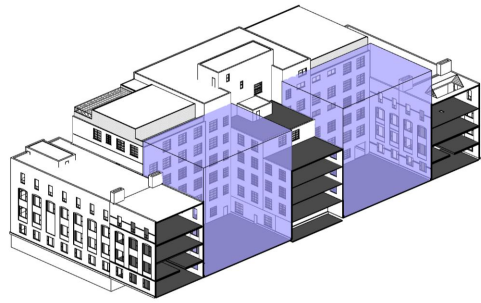
Atrium Level 1 Plan - Potential Event Configuration



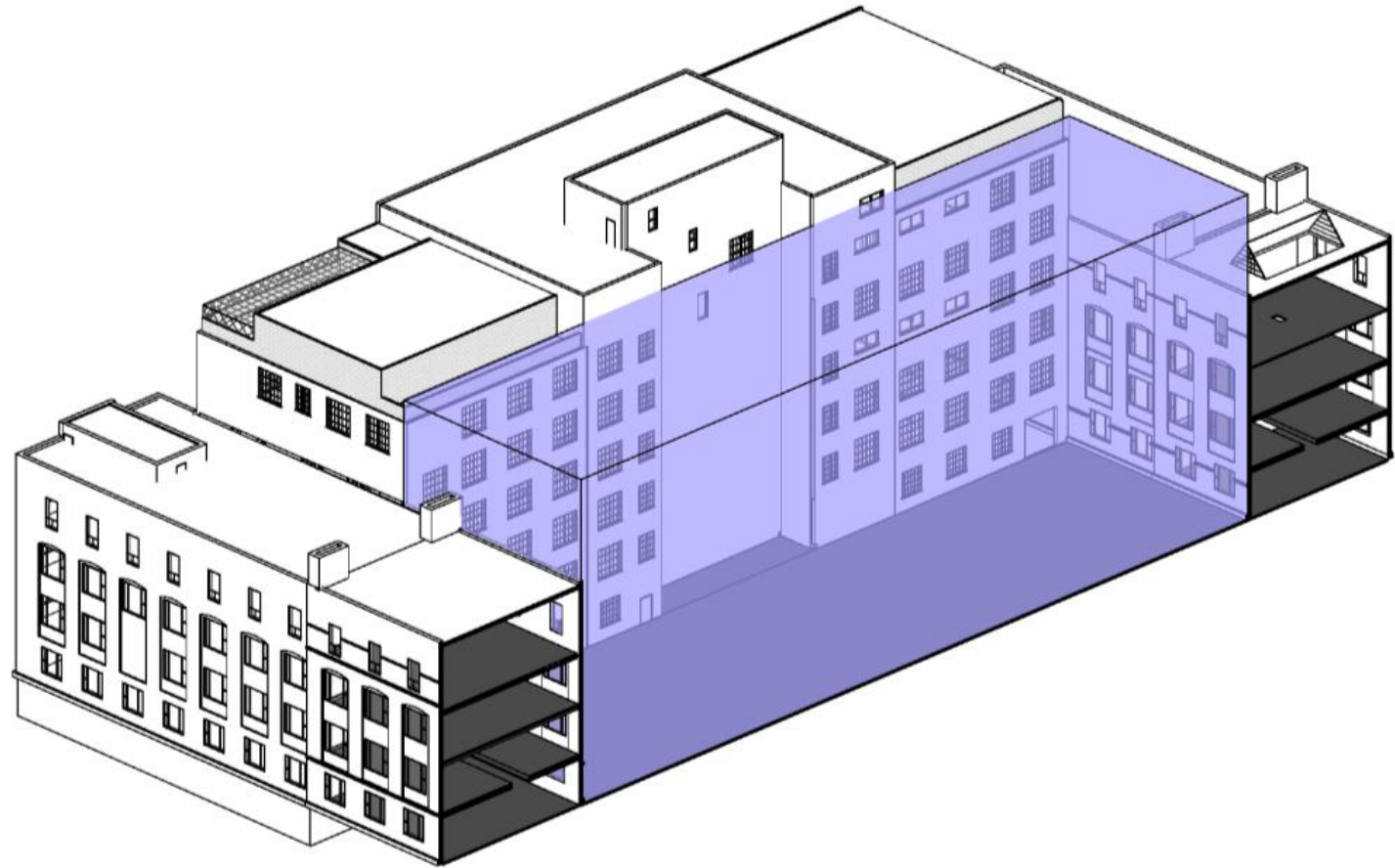
3. Design Concepts

3.1 The Atrium





Atrium Massing Studies



Atrium - Massing Study

In the first Visioning Session with senior University stakeholders, a series of approaches to the central courtyards of the existing building were explored. The existing building has two exterior courtyards, and the consultant team shared different concepts to how these courtyards could become interior space:

- Two Atria separate:
 - Maintain both courtyards as two volumes – but as interior atrium spaces;
- Two Atria connected below:
 - Demolish a lower portion of the existing centre wing, so that the two courtyards can be interconnected at the atrium floor level (Level 1);
- Two Atria connected above:
 - Demolish an upper portion of the existing centre wing, so that the two courtyards can be interconnected at top of the atrium (Level 4,5,6);
- One Atrium
 - Demolish the center wing entirely, thereby creating one interior volume.

The One Atrium concept was considered the most appropriate for creating a sense of grandeur and a sense of togetherness. Stakeholders liked the concept of an interior quad for the campus – both for hosting ceremonial events but also to act as a hub of circulation and conversation among staff and students. The atrium would be a space that can be seen from every wing of the building, and could be appreciated by patrons on every floor – a truly dynamic space.

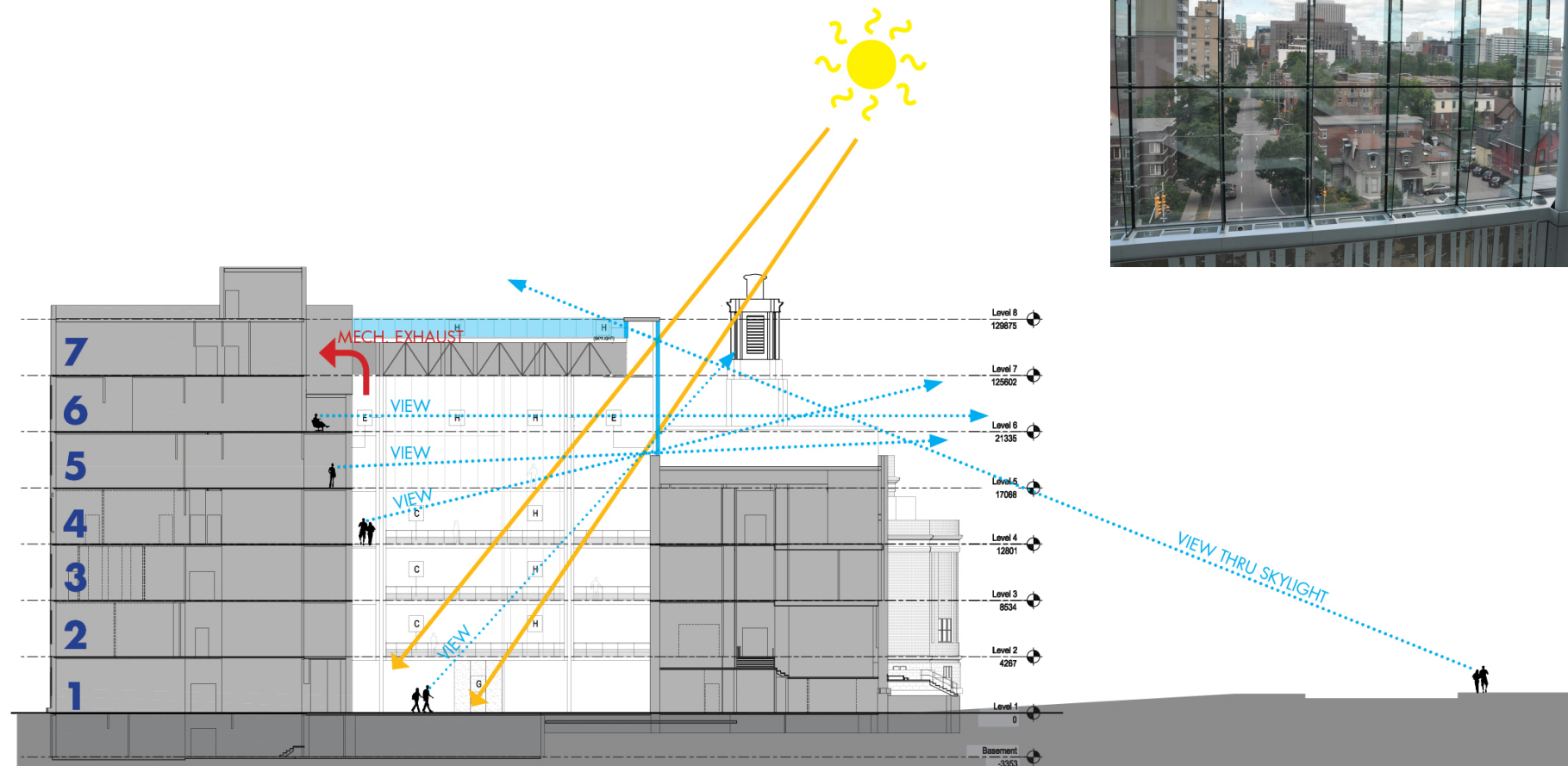
Atrium - Concept for the Exterior Architectural Expressions

For the building's exterior appearance, because of the historical importance of the 1922 facades on south east and west, the only real new expression would be for the atrium at the top of the building. As the atrium must rise higher than the 1922 wing in order to bring in light, this element proves to be the main new architectural element on the building.

The concept for the atrium's expression on the exterior is to reveal it like a lantern on the top of the building. This lantern is clear by day, bringing daylight into the center of the building, but at night, it is a beacon of light glowing at the center of campus. This glass box is deliberately modern in its detailing as to contrast it to the traditional style of the rest of the building. It is intentionally simple and elegant, sitting like a crown on top of the historic building. Two recent precedent examples of this lantern concept include the Museum of Nature in Ottawa, Ontario and the Tate Modern in London, England.



Tate Modern - London



Atrium Glazing Strategy - Section



Museum of Nature - Ottawa

3.1 Atrium - Exterior Expressions





The Winter Garden

Special Spaces

The story described on the previous storyboards is but one of many stories that will be told in this building. The layering of such stories, and the tours those stories will shape, provide a rich and diverse experience for visitors and patrons of the building alike.

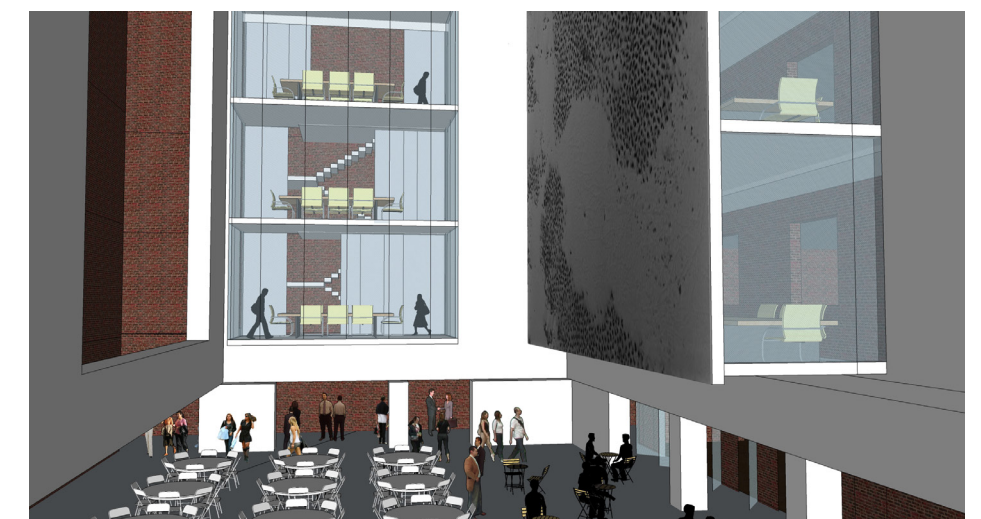
There are a series of additional special spaces that have been carefully considered for their contribution to a layered experience of this historically significant facility on campus. These special spaces are described below.

Winter Garden

For the upper floors of the building (Levels 5 and 6), a special space is created on Level 5 at the top of the atrium. This space can be seen from the atrium below, and the bridges that criss-cross through the space. This Winter Garden, filled with greenery, plants and park benches and flooded in natural daylight, provides a destination for senior staff to conduct private face-to-face discussions, or to simply seek a moment of quiet in an otherwise busy day. This two-storey space is meant to be quiet and intimate - a deliberate counterpoint to the liveliness of the atrium below.

Meeting Rooms

As the building will be occupied on virtually every floor by administrators in office environments, there is an opportunity to collocate or centralize shared spaces, and bring people together at the center of the building. The intention is to create a series of glass meeting rooms that hang in the atrium – adding to the vibrancy of the atrium itself, but also highlighting the interdisciplinary way the administrators in the building will work together. These shared meeting rooms will vary in size and shape, and may have translucent film for some sense of privacy, but are intended to be shared by all building tenants.



Projected Meeting Rooms



Council Chambers Perspective

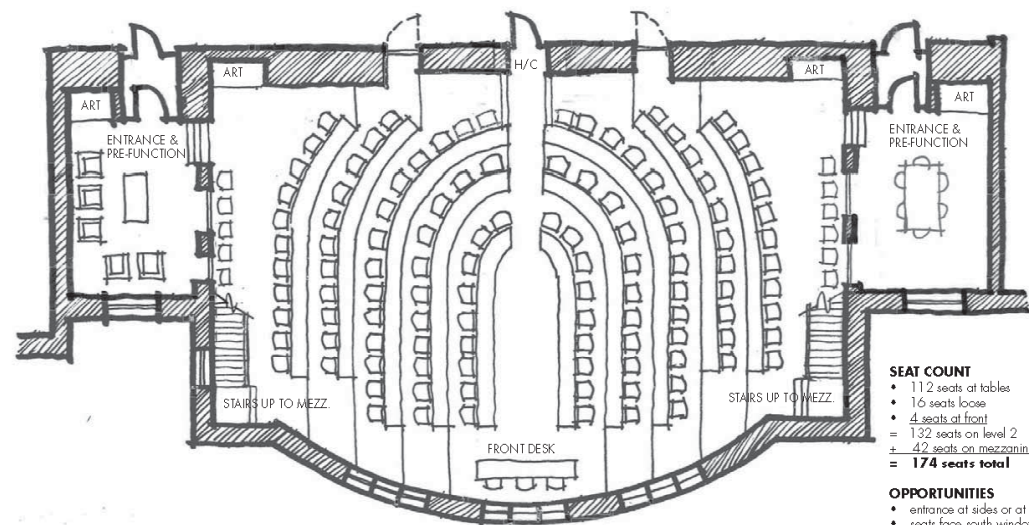
Council Chambers

The original 1922 wing had two tiered lecture theatres on Level 2 (with upper level access at Level 3). The intention is to repurpose the west-lecture theatre into the new Council Chambers for the campus. This two-storey space will honour and restore some of the historic features of the room, including the clerestory windows at the top that bathe the room in natural light through a featured wooden-lattice in the ceiling, and the south-facing windows that are currently hidden under the tiers of the existing lecture theatre.

The renovated space will also offer some modern elements in contrast to the original room, including the latest technology for projection screens, voting protocols, etc. This room will be made accessible to patrons with disabilities, and will have pre-function spaces on either side (for wine and cheese events, etc.) There will be an upper gallery on Level 3, with the additional seating required for large events like General Faculties Council, and for visitors to witness special events, guest speakers, etc.



Existing Theatre



Proposed Floor plan using Lecture Theatre 2-104

SEAT COUNT

- 112 seats at tables
- 16 seats loose
- 4 seats at front
- = 132 seats on level 2
- + 42 seats on mezzanine
- = **174 seats total**

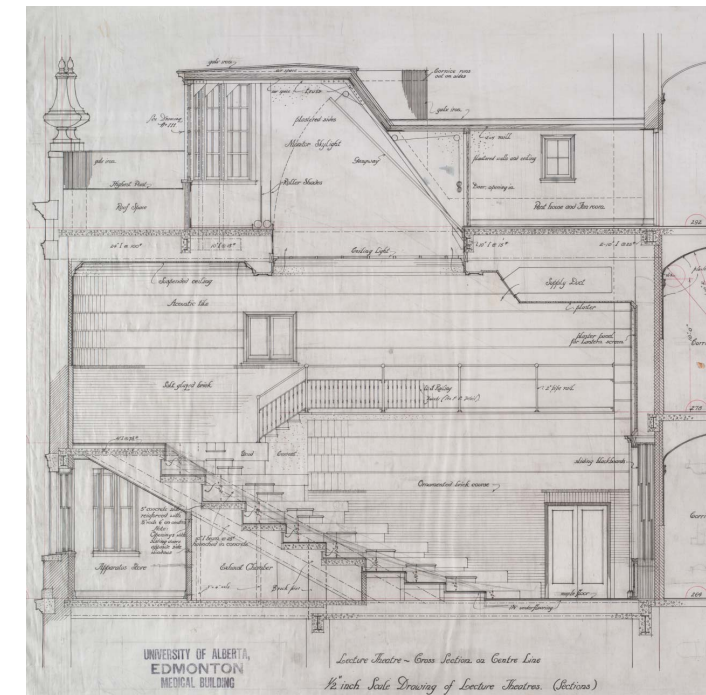
OPPORTUNITIES

- entrance at sides or at back of room
- seats face south windows
- arranged in tiers like existing Council Chambers, for good sightlines
- 2 crush spaces, one on either side
- lots of display space
- stairs to mezzanine above

CHALLENGES

- presentation screen above south windows could cause glare problems, but 2 sets of blinds (one screen, one blackout) would solve this
- ante-rooms must have vestibules because they open onto the historical exit stairs
- H/C entrance is at front (northend) of room

Council Chambers Proposed Plan



Original Theatre Section

3. Design Concepts

3.2 Special Spaces: The Council Chambers





Reading Room

The original 1922 building had a truly special room above the Level 2 lobby – this was called “the Student Reading Room” for the building’s medical students at the time. The original building did not have many special interior spaces, so this room will receive special attention, and where possible, historic elements like the ornate carved-plaster oval ceiling will be restored. This room will function as a ceremonial signing room and/or meeting room for special events on campus.

Café

Stakeholders at the first Visioning Session explained that this building should not have a food court, as it should not be seen as competing with the vibrant retail activities of SUB. However, as there will be a large number of administrators in the building, there needs to be somewhere in the building to grab a coffee and a muffin for an intimate conversation with colleagues or with a student-advisor. And because the atrium itself may be programmed for large group events, a food retailer should not take up real-estate in the middle of the atrium.

Therefore, the intention is to create an upscale café directly adjacent to the atrium, in the north-west corner. This one-storey space is tucked under the 1958 wing on the main floor, such that it supports the functions and vibrancy of the atrium, and is accessible to the market-style retail environment to come in the North Powerplant precinct. Students and staff from across campus will be welcome here, but it will not be acoustically disruptive to the rest of the atrium or adjacent office-uses.



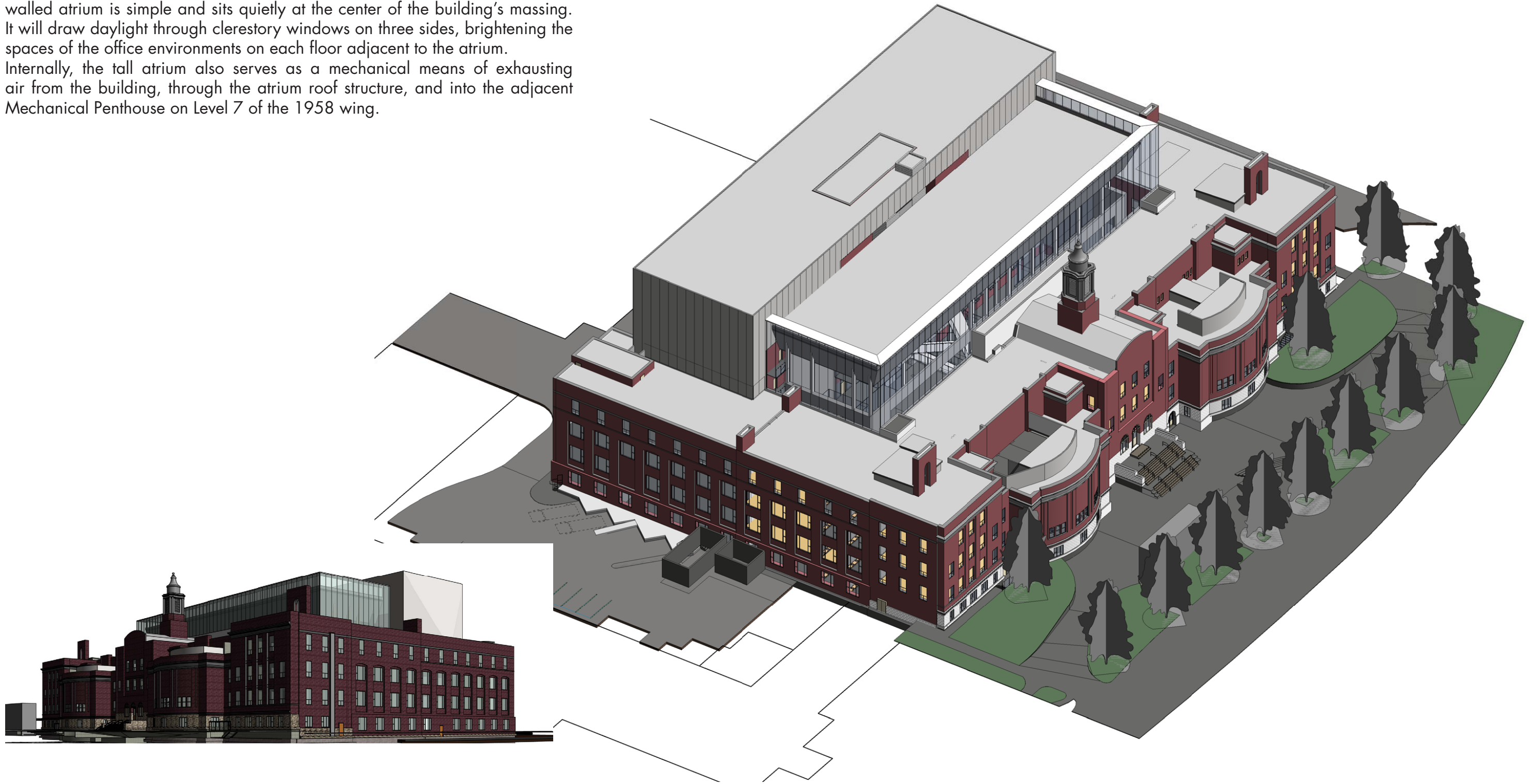
Cafe

3.2 Special Spaces: The Cafe



Atrium Massing and Enclosure

On the exterior, the glass box of the new atrium sits as the key feature on top of the building, acting as a lantern behind the existing historical spire. This curtain-walled atrium is simple and sits quietly at the center of the building's massing. It will draw daylight through clerestory windows on three sides, brightening the spaces of the office environments on each floor adjacent to the atrium. Internally, the tall atrium also serves as a mechanical means of exhausting air from the building, through the atrium roof structure, and into the adjacent Mechanical Penthouse on Level 7 of the 1958 wing.



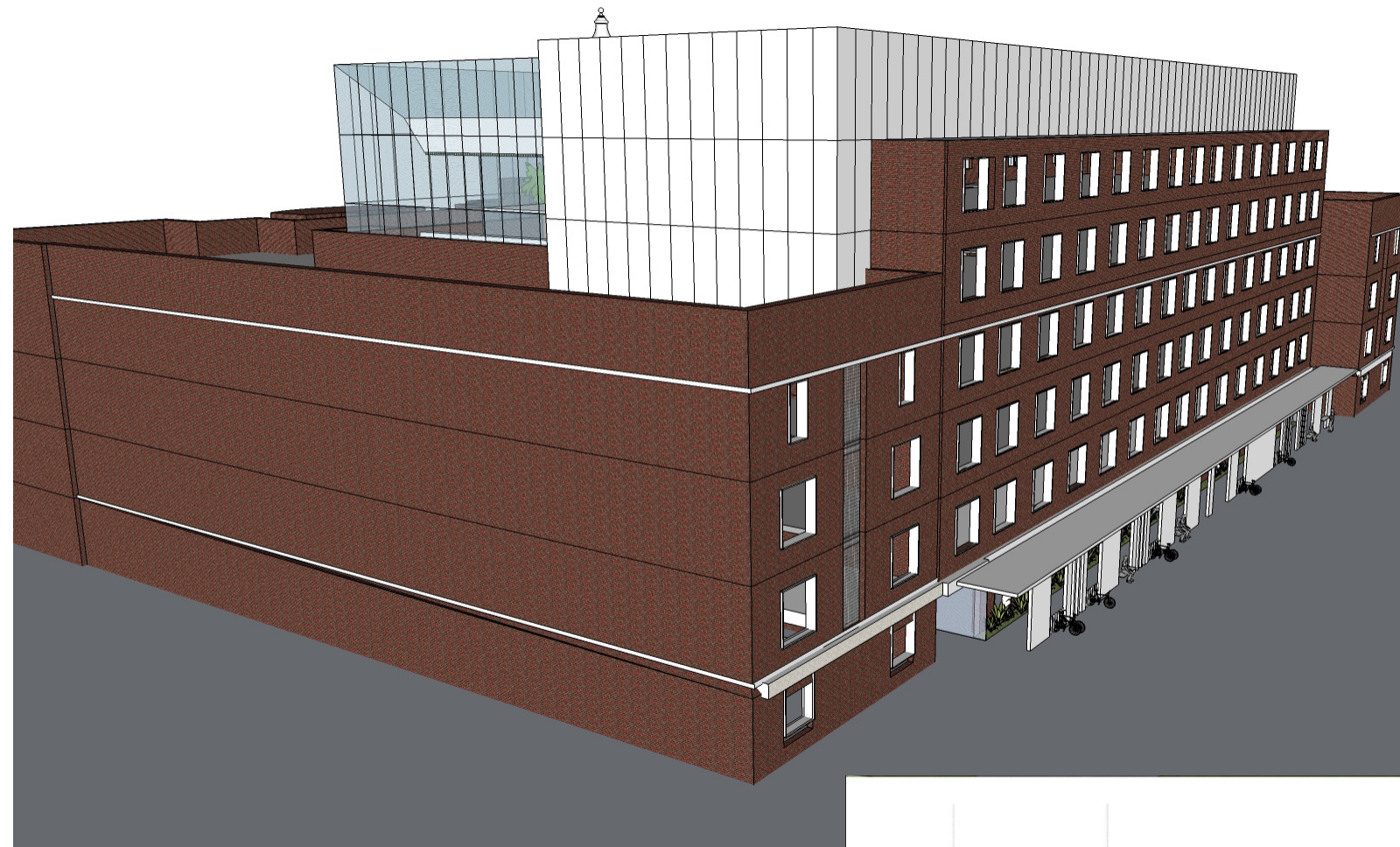
Penthouse

The building's existing walls and roof on Level 7 (the highest floor on the north side) will be removed to make way for a new mechanical penthouse. This floor is not suitable for occupants as it has no windows, and the project team has intentionally limited the height of occupied floors to six storeys, so as not to be considered a "high-building" in the Alberta Building Code, triggering complex and unnecessary code upgrades to the entire facility.

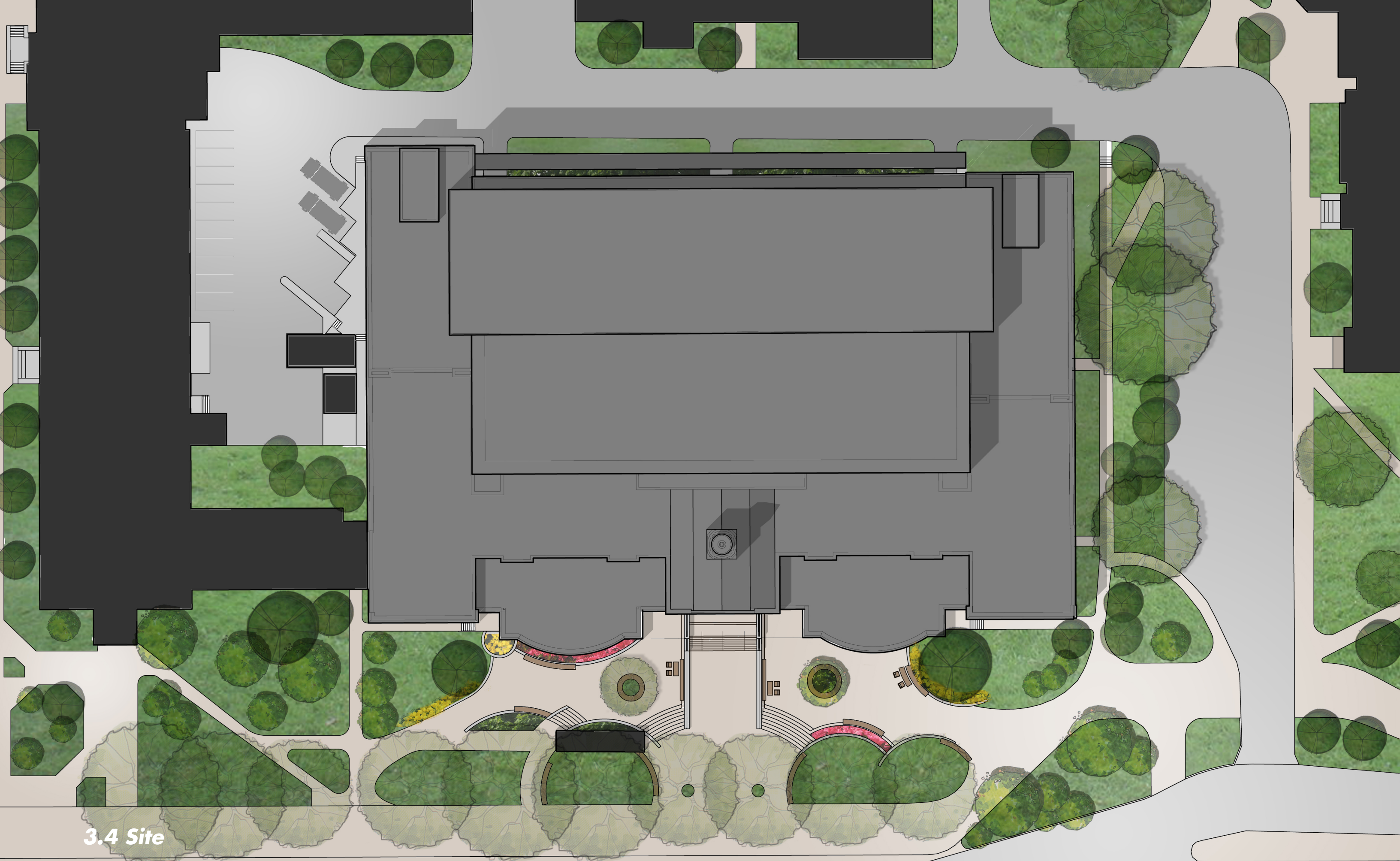
The architectural massing of this new mechanical penthouse is higher than the glass box of the atrium, partly due to the two-levels of mechanical equipment housed inside, and partly to provide a backdrop for the atrium clerestory glazing to connect into.

The mechanical penthouse is set back from the existing brick on the north face, so that the penthouse reads as its own mass, with its own material, and thereby reducing the apparent height of the north face by expressing the brick in only 6 storeys. The penthouse will be clad in metal panels with architectural reveals, deliberately contrasting both the traditional brick of the 1958 wing and the modern glazing of the atrium lantern. This penthouse will not easily be seen from ground level around the building, but will be seen from views further back, such as across 89th Avenue, or at the exit doors of Rutherford Library.

The existing north façade is not as ornately detailed as the 1922 wings on south, east and west. As such, the intention is to provide some subtle modern interventions to this wing, as part of the window replacement that is essential. The window frames will be expressed as extensions past the existing brick face, providing some visual interest on the otherwise plain existing façade. In addition, a new pedestrian-scaled canopy at ground level will be built to enhance the three entrances into the building on the north side. This canopy is intended to pick up on the existing precast coursing band at the one-storey mark along the north façade.



3.3 Mechanical Penthouse



3.4 Site

Site Context

The site around the building has four distinct zones:

- The south plaza, providing formal entry to the building's historical front door;
- The north Powerplant Walk, currently perceived as a less-formal or "back-door" experience;
- The west courtyard between the building and the adjacent South Academic Building (SAB);
- The east yard, which currently provides a sidewalk connection around the building, but largely access to surface parking and the Rutherford Library.

This Design Development Report recommends significant site and landscape improvements to three of the spaces listed above: the South Plaza, the North Powerplant Walk, and the SAB courtyard.

South Plaza

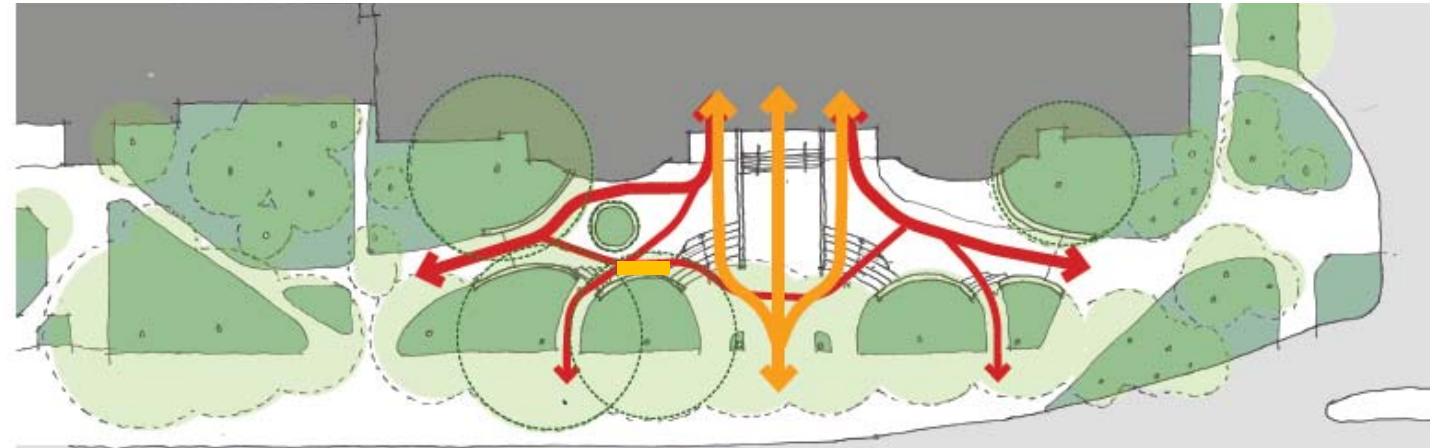
On the south lawn of the building, the intent is to provide both formal and informal entrance into the redeveloped building. The existing ceremonial steps will be refurbished, as part of the formal entrance for first-time visitors to the building, taking them up into the historical lobby – and onto Level 2. At the same time, because the new atrium floor is actually on Level 1 at the center of the building, there needs to be a handicap accessible entrance to the building from the south side. So the recommendation is to partially carve down the south lawn by up to a half-storey, creating an accessible entrance and an informal procession into the building on Level 1, on either side of the existing exterior staircase.

This layering of formal and informal entrance produces a rich landscape design for the south lawn. The ceremonial approach on axis to the front doors is contrasted by the informal curvilinear ramping down approach to the Level 1 entrances.

This space is meant to feel like an intimate roaming garden experience, where students and staff that are very familiar with the campus can come and sit on planter edges, on park benches, in the warmth of the sun.

Also, because the intent is to keep as many of the large historic elm trees, coniferous trees, and honorary/donor trees, the excavation down of half a storey to the new entrances has been carefully designed to respect the root structures of those significant trees.

The south plaza also has an existing one-storey brick LRT entrance, which is being studied under a separate scope for how it can be modified to fit in the improved landscape, and not block the front entrance as much as it currently does.



3.4 Site - South Plaza



North Powerplant Walk

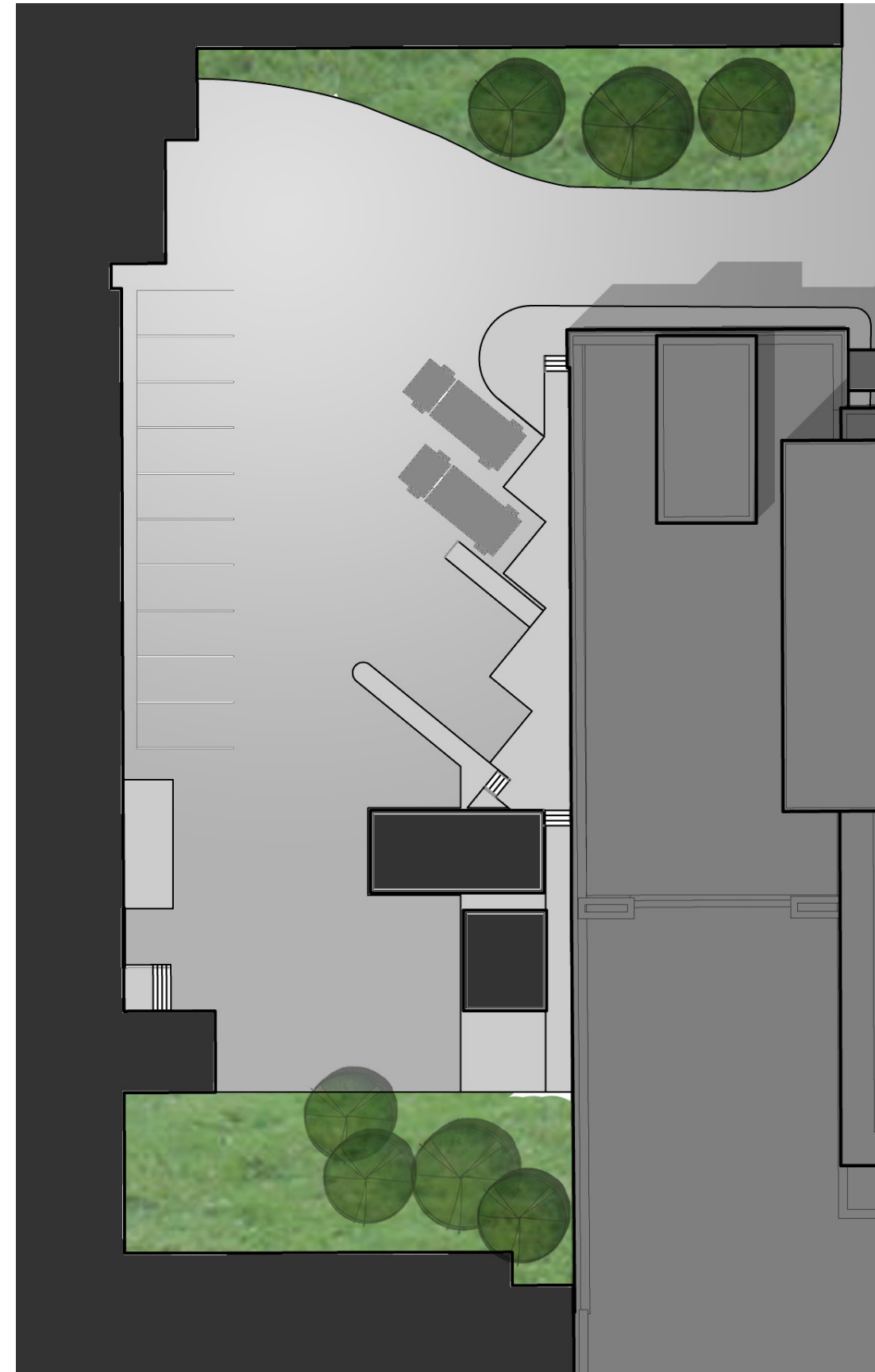
The University's long-term vision for the asphalt zone between the existing Dentistry-Pharmacy Building and the Powerplant building to the north, involves improving the pedestrian experience and programming of adjacent spaces to create a student and retail-focused neighbourhood. This space, while still functioning to provide service vehicle access to a series of buildings, needs to be more than an alley.

As such, redevelopment of the Dentistry-Pharmacy Building offers an opportunity to promote a richer pedestrian-scaled experience along the path adjacent to the building. Therefore, a new one-storey canopy along the north face is recommended. This new canopy will provide protection from the elements, reduce the scale of the six-storey building, promote pedestrian movement to the three new entrances into the building, and provide a space for park-benches, bike-racks, planters, and other outdoor furnishings. This canopy is intended to pick up on the existing precast coursing band at the one-storey mark along the north façade.

SAB Courtyard

The courtyard between the Dentistry Pharmacy and South Academic Buildings will retain its service functions and access from the North Power Plant service road. A new Loading Dock complete with garbage compactors and elevated platform will service the redeveloped building.

New emergency generators will also be located in the courtyard to service the building and the SLOWPOKE facility to the South of the loading dock.



3. Design Concepts

Floor plans

The following pages document the Schematic Design layout of the building, floor-by-floor. The scope of the project at this time is to simply provide the “Core and Shell” for the building’s redevelopment. This includes the building’s exterior, its interior public areas (like lobbies, atria, and washrooms), its interior circulation (public hallways and elevators), and the service areas related to core building operations (mechanical and electrical rooms, etc.).

The “Core and Shell” scope excludes the programming and design of tenant areas. At this time, it is understood that the majority of the building will function as an office building, providing office and support space to various senior administration units from across the campus. The interior fit-up designs for these areas will come at a later stage in the project.

Removal of the Centre Wing

As previously described in this report, the existing centre wing of the building will be deconstructed and removed, such that there will be one large atrium at the center of the building. While this decision removes some program area from the center wing being removed, almost an equivalent amount of program area is being added back into the building in more interesting ways (for example, the meeting rooms and winter garden that project into the new atrium).

Circulation concept

One of the biggest problems with the existing building is that it is difficult to understand circulation through the building, and difficult for the user to understand where they are. The intent of this redevelopment concept is to make circulation obvious and clear to visitors arriving at the building, as well as to tenants that work in the building day-to-day. For this reason, rather than have double-loaded corridors that jig and jog through each wing of the building, the concept is to align the corridor along the new internal atrium wherever possible, on every floor. This will allow patrons to always understand where they are in the building, relative to the centralizing element of the large daylit atrium.

With the removal of the center wing on such a large floor-plate, it is still essential that there be a clear circulation path from the south 1922 wing to the north 1958 wing. Therefore, there are three bridges that connect the north and south wings to each other, and focus pedestrian traffic at the public elevator lobby at the center of the north wing. These bridges serve a practical function of improving pedestrian flow, but also animate the atrium, and help tenants feel connected with the common space at the center of the building.

The elevator core is designed on the north wing to re-use the two existing shafts of the 1958 building, and add two additional public elevators in that location. This creates an elevator lobby directly adjacent to the atrium on the north side of every floorplate.

Philosophy of Tenant Areas

On the floor plans, each of the tenant areas that could be programmed and designed for future use are shaded grey. The possibilities for layouts within these tenant areas will be explored further in Design Development. These possibilities will include combinations of open and closed workstations in the open office environments.

Washrooms

On each floor, there are three service areas to cover the large floor plate of the building. These service areas provide space for public washrooms, janitor rooms, mechanical and electrical distribution, and communication rooms. Each of these service areas are located in areas of the floorplan where they have the least impact on useable space by a tenant (for example, they are kept away from the outside wall of windows where possible). On the north wing, the washrooms are conveniently located near the elevator lobby and near the corridor along the atrium.

Special Areas

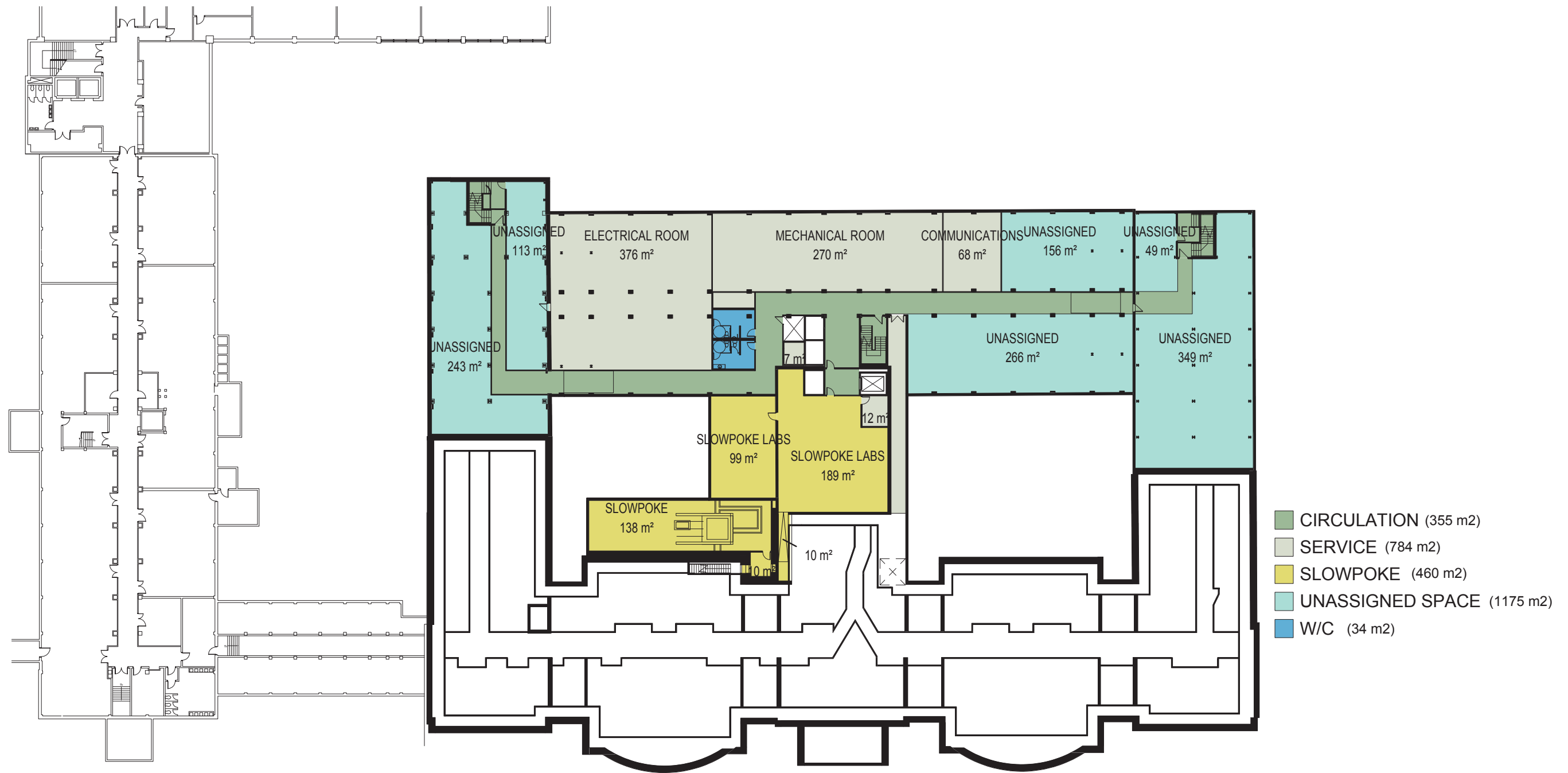
There are a handful of special areas in the building, that have been described earlier in this report. These include the existing Level 2 Lobby, a new Level 1 Lobby, the Council Chambers on Level 2, and the historic Student Reading Room on Level 3. These special areas are identified on the floorplans in brown colour.

Shared Meeting Rooms

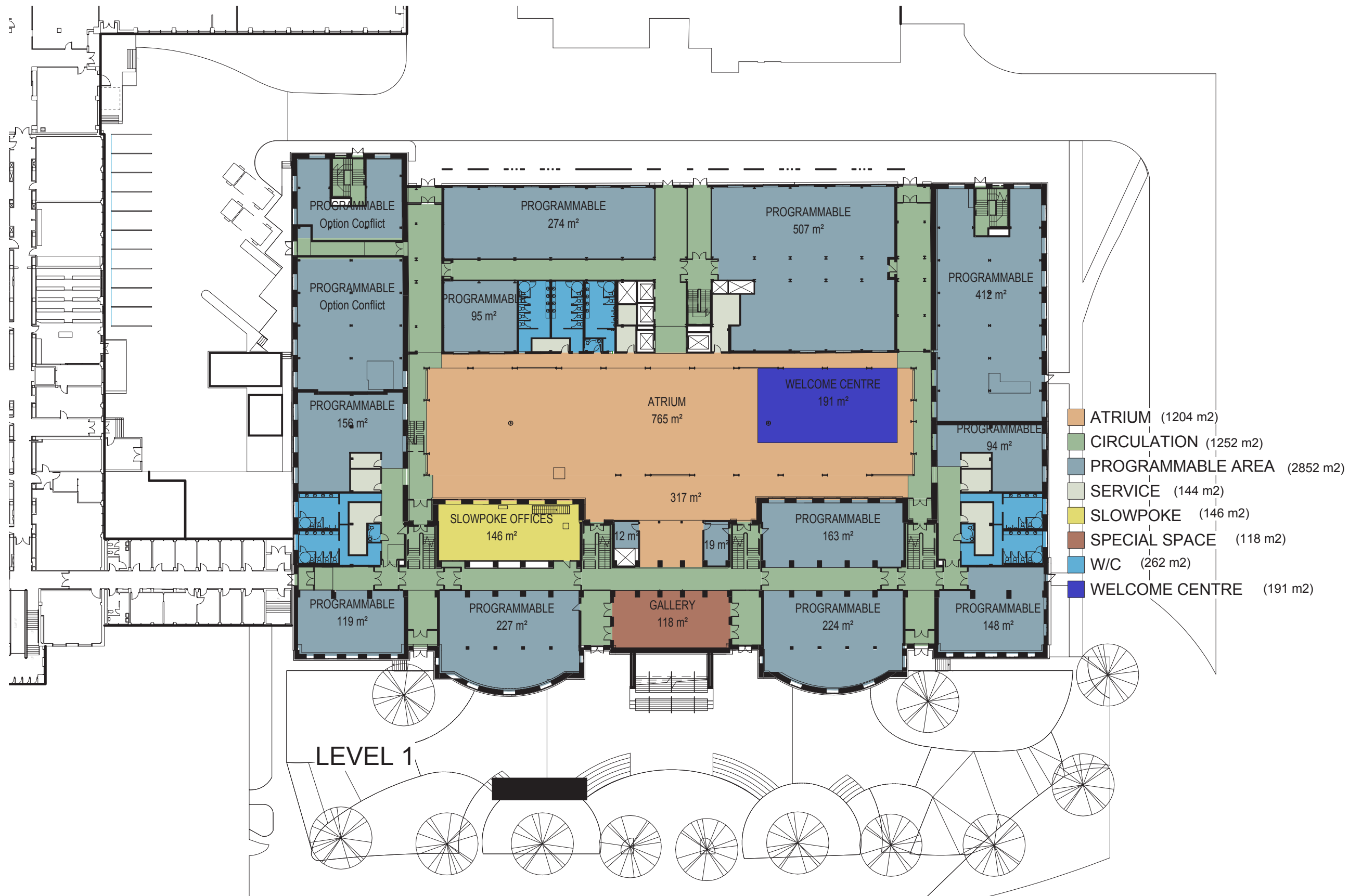
As a wide assortment of University administrators will come together in this building for the first time in decades, there is an opportunity to promote a cross-pollination of ideas and staff camaraderie by providing shared spaces for all users in the building. The intention is to create a series of glass meeting rooms that hang in the atrium. These shared meeting rooms will vary in size and shape, and may have translucent film for some sense of privacy, but are intended to be shared by all building tenants and will be centrally scheduled for all building users. There will be some tenants in the building that will still require dedicated meeting rooms inside their tenant spaces, but certainly there is an option to improve efficiencies on the use of meeting rooms, and therefore provide several that are shared by all building tenants. On the subsequent floor plans, these shared spaces are identified in magenta colour.

SLOWPOKE

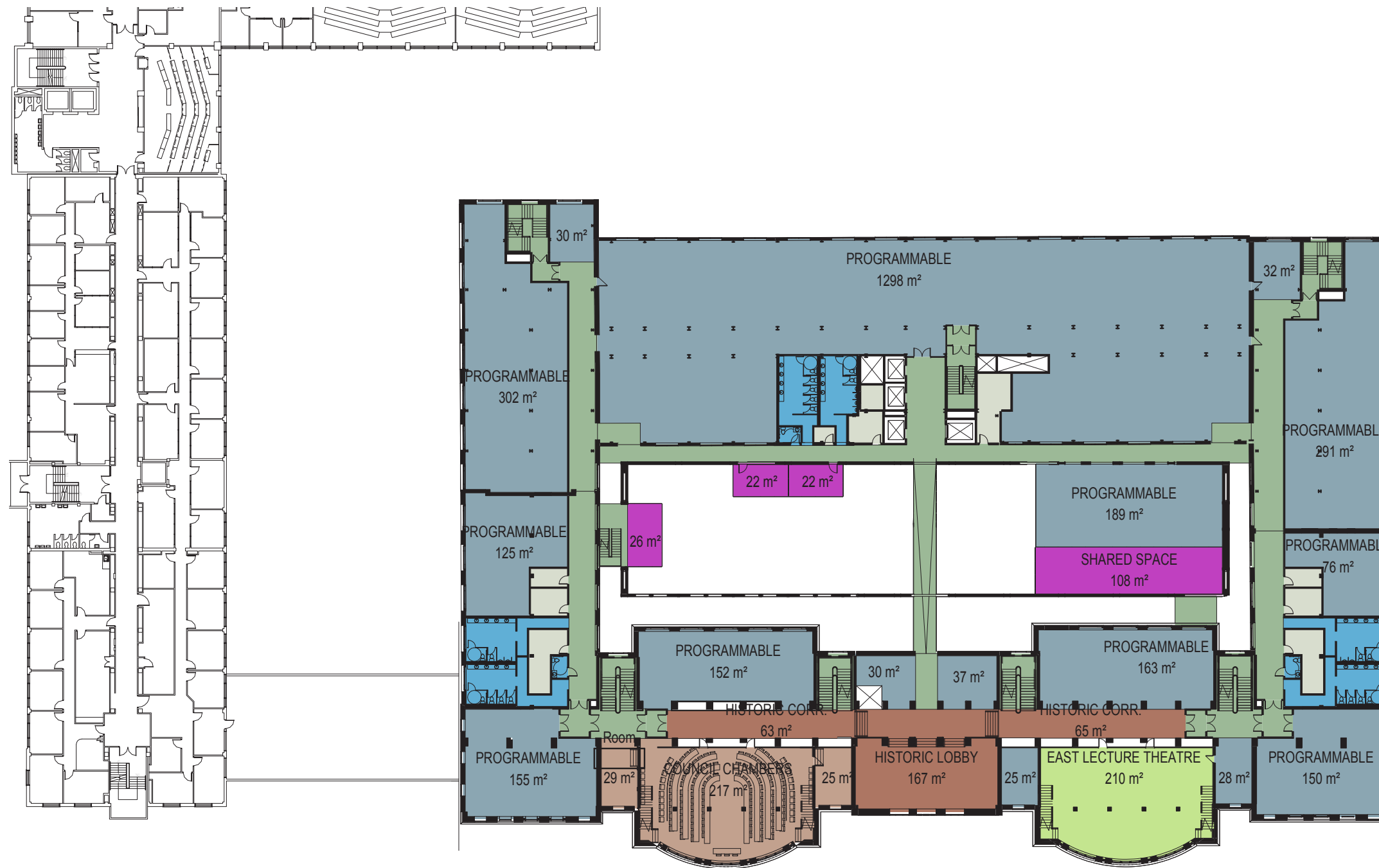
The existing SLOWPOKE laboratory in the basement and Level 1 of the 1922 wing will remain active in its current location. Extensive consultation has occurred with the users of this lab, and the recommendations for how this laboratory is reconfigured and allowed space to grow is detailed in Appendix D of this report.



BASEMENT LEVEL



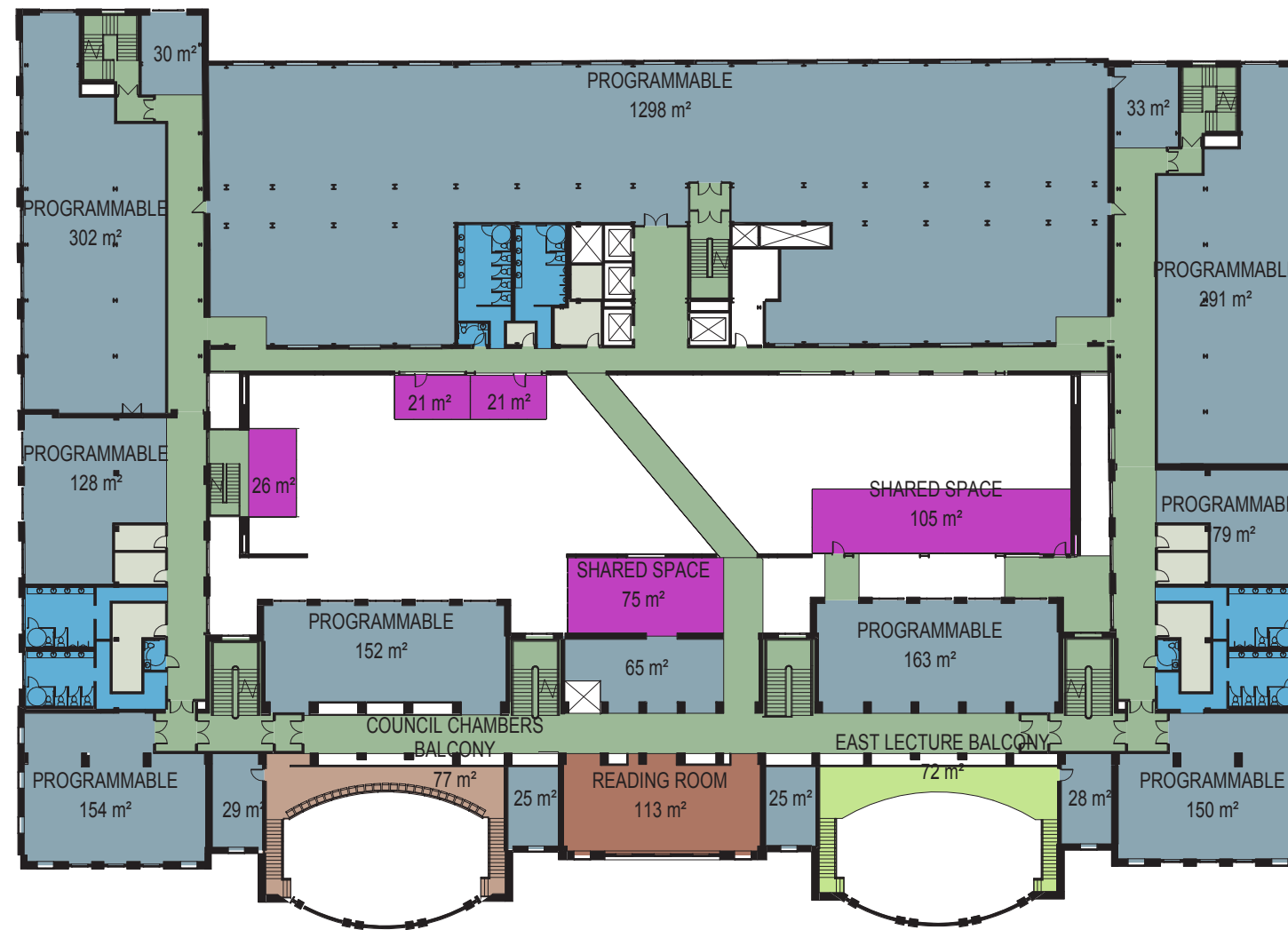
3.5 Level 1 (Atrium Floor and Grade Level)



- CIRCULATION (870 m²)
- COUNCIL CHAMBER (271 m²)
- EAST LECTURE THEATRE (210 m²)
- PROGRAMMABLE AREA (3082 m²)
- SERVICE (146 m²)
- SHARED SPACE (177 m²)
- SPECIAL SPACE (294 m²)
- W/C (225 m²)

LEVEL 2

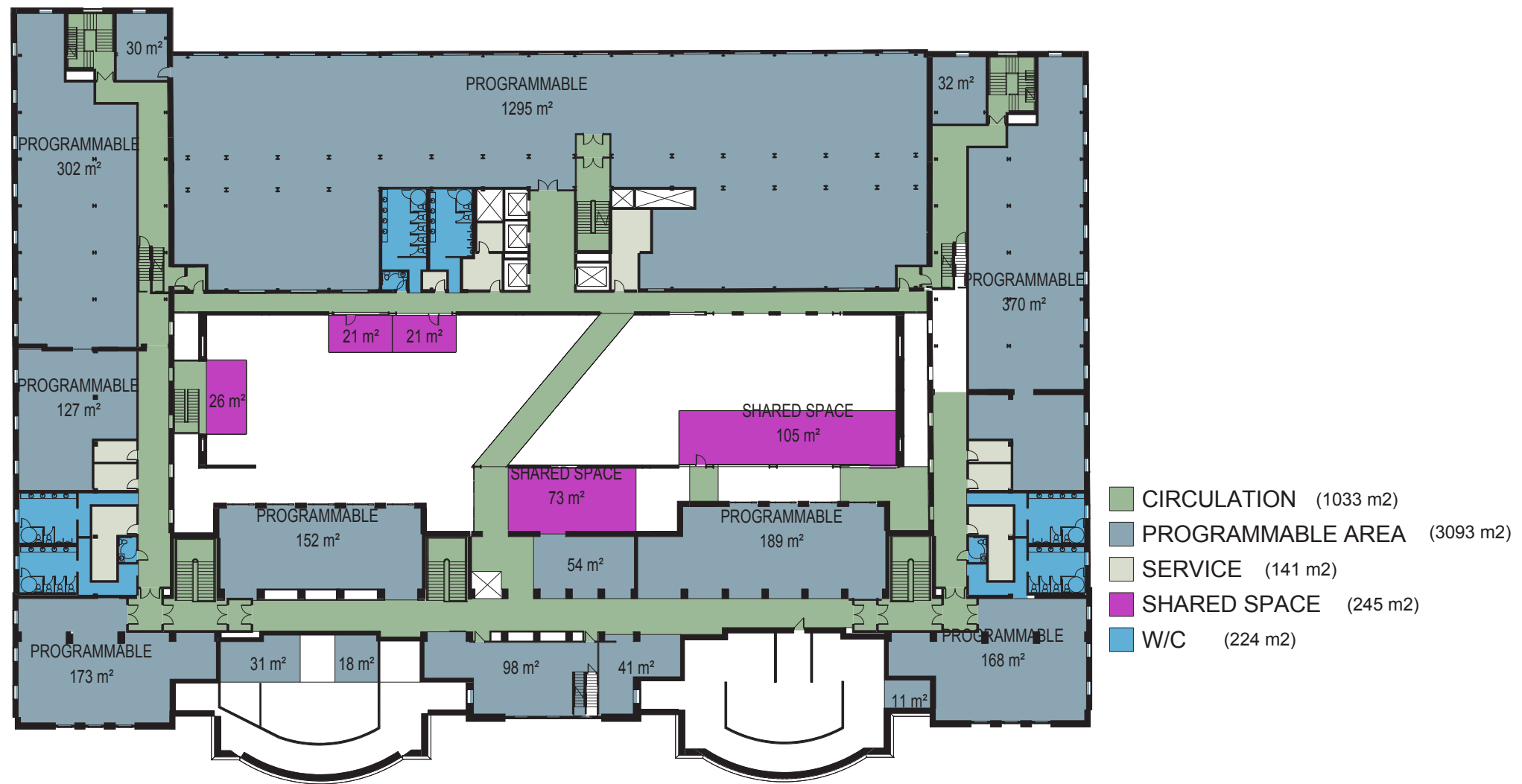




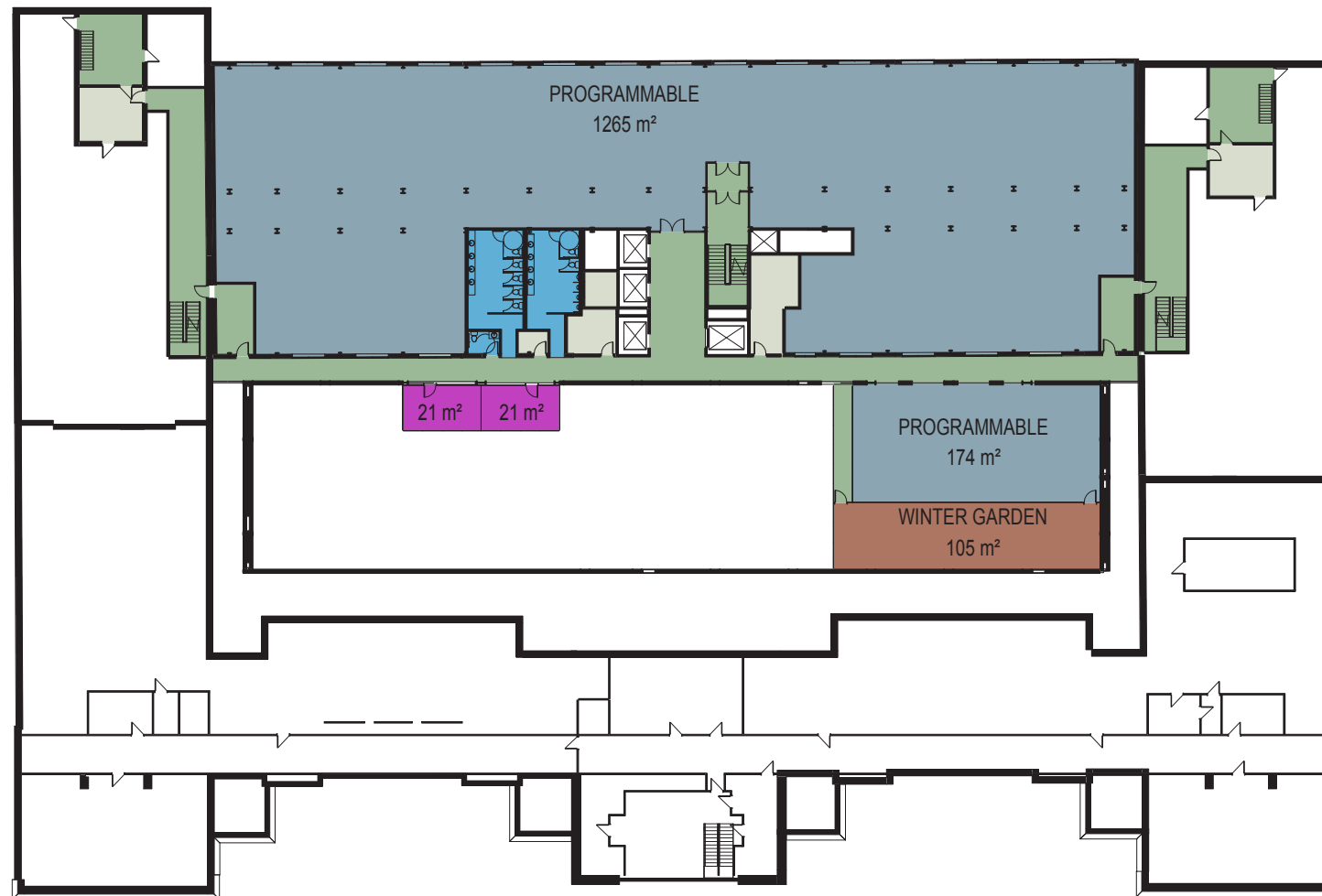
- CIRCULATION (1092 m2)
- COUNCIL CHAMBER (77 m2)
- EAST LECTURE THEATRE (72 m2)
- PROGRAMMABLE AREA (2951 m2)
- SERVICE (118 m2)
- SHARED SPACE (247 m2)
- SPECIAL SPACE (113 m2)
- W/C (225 m2)

LEVEL 3

3. Design Concepts

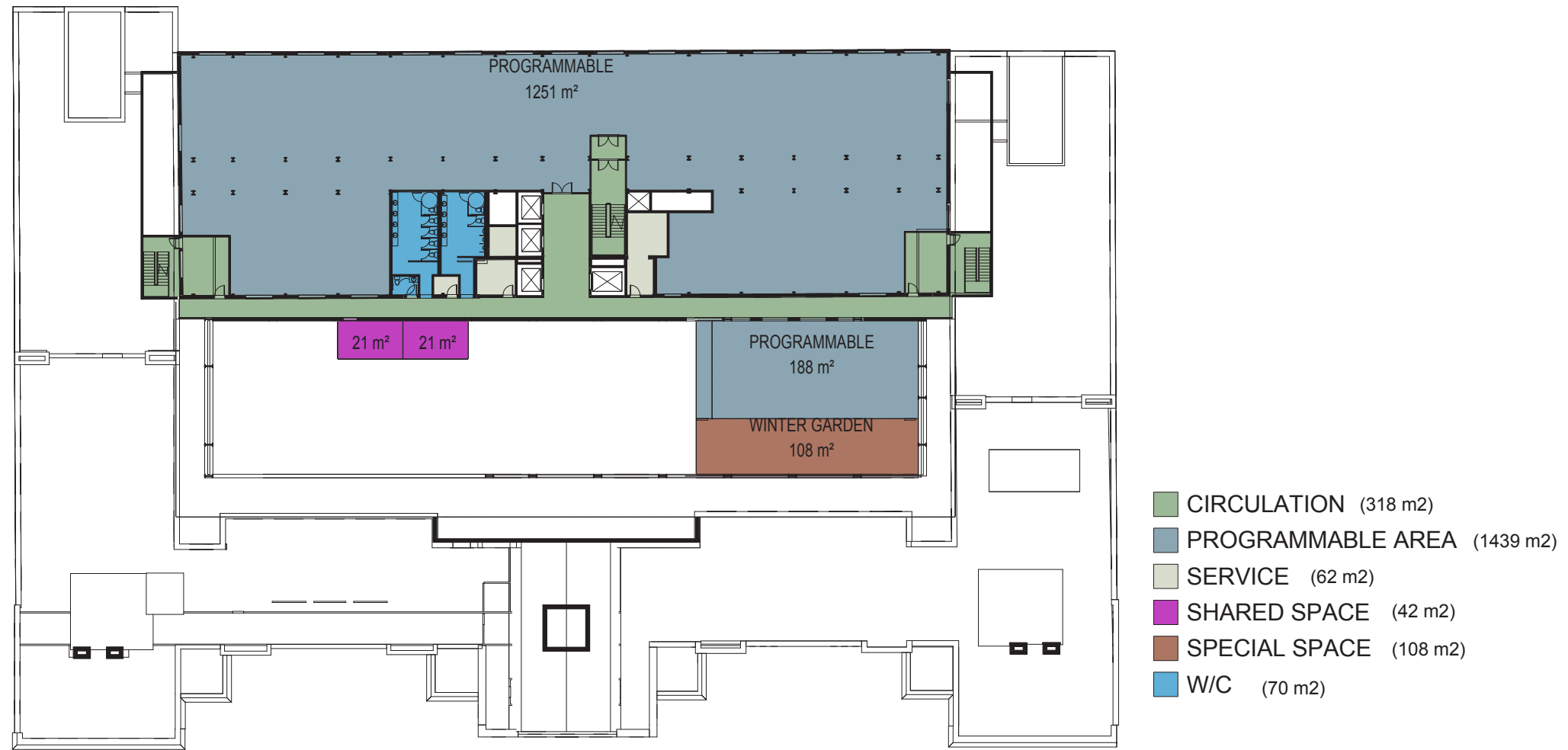


LEVEL 4

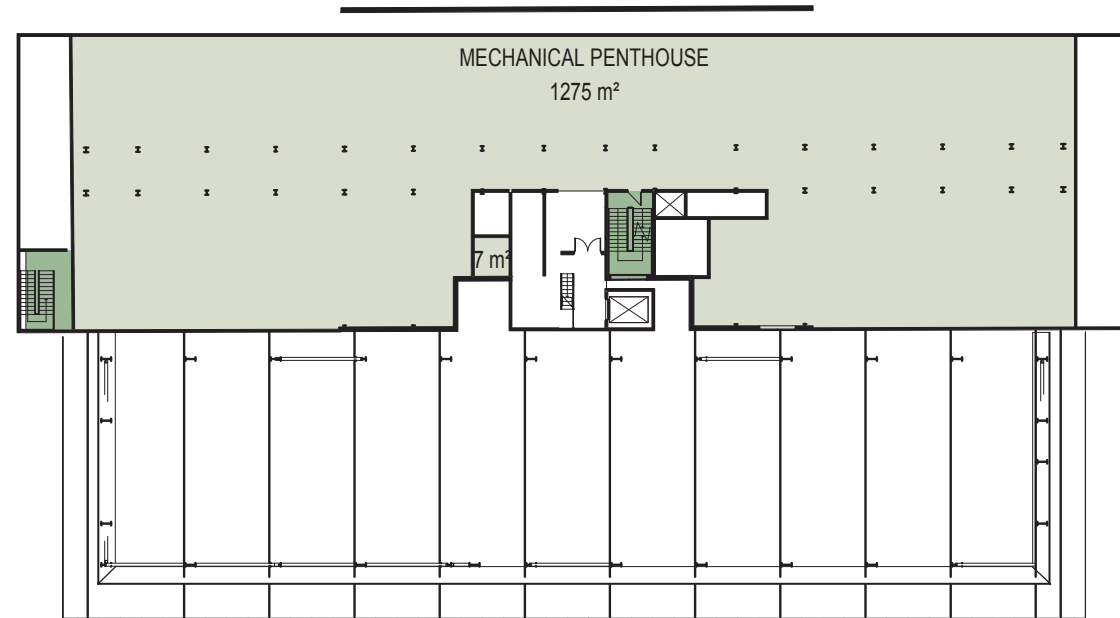


- CIRCULATION (449 m2)
- PROGRAMMABLE AREA (1439 m2)
- SERVICE (102 m2)
- SHARED SPACE (42 m2)
- SPECIAL SPACE (105 m2)
- W/C (70 m2)

LEVEL 5



LEVEL 6

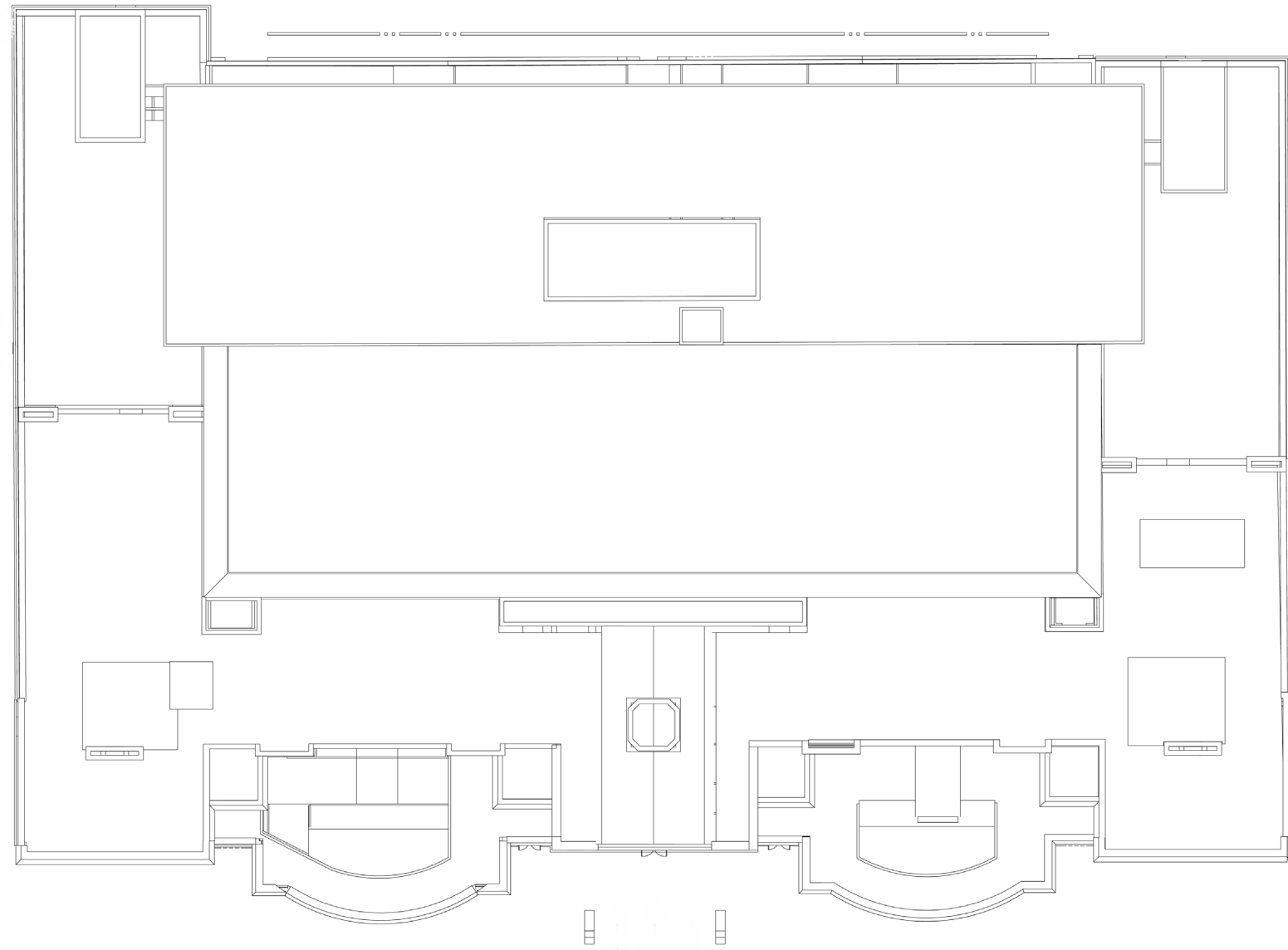


- CIRCULATION (106 m²)
- SERVICE (1298 m²)



PENTHOUSE

3. Design Concepts



Dentistry Pharmacy Building Redevelopment														
Program Areas														
September 13, 2012														
Component	Program Name	Component Area												
		Basement	Level 1	Level 2	Level 3	Level 4	Level 5	Level 6	Mechanical Penthouse					
Assignable Space														
	Programmed Area	0.0 m2	2834.0 m2	3082.0 m2	2951.0 m2	3093.0 m2	1439.0 m2	1439.0 m2	0.0 m2					
	Atrium	0.0 m2	1204.0 m2	0.0 m2	0.0 m2	0.0 m2	0.0 m2	0.0 m2	0.0 m2					
	Special Space	0.0 m2	118.0 m2	294.0 m2	113.0 m2	0.0 m2	0.0 m2	0.0 m2	0.0 m2					
	Welcome Centre	0.0 m2	191.0 m2	0.0 m2	0.0 m2	0.0 m2	0.0 m2	0.0 m2	0.0 m2					
	Council Chambers	0.0 m2	0.0 m2	271.0 m2	77.0 m2	0.0 m2	0.0 m2	0.0 m2	0.0 m2					
	East Lecture Theatre	0.0 m2	0.0 m2	210.0 m2	0.0 m2	0.0 m2	0.0 m2	0.0 m2	0.0 m2					
	Shared Space	0.0 m2	0.0 m2	177.0 m2	247.0 m2	245.0 m2	42.0 m2	42.0 m2	0.0 m2					
	SLOWPOKE	447.2 m2	146.0 m2	0.0 m2	0.0 m2	0.0 m2	0.0 m2	0.0 m2	0.0 m2					
	Unassigned Space (Central Support)	1194.0 m2	0.0 m2	0.0 m2	0.0 m2	0.0 m2	0.0 m2	0.0 m2	0.0 m2					
A	Component Gross Area Available by Level (Net Assignable)	1641.2 m2	4493.0 m2	4034.0 m2	3388.0 m2	3338.0 m2	1481.0 m2	1481.0 m2	0.0 m2					
Non-Assignable Space														
	Z1. Structural Area/Shafts/Unusable	235.3 m2	631.1 m2	337.5 m2	231.7 m2	563.6 m2	179.6 m2	347.6 m2	52.3 m2					
	Z2. Circulation Area	415.0 m2	1252.0 m2	870.0 m2	1091.0 m2	1033.0 m2	449.0 m2	318.0 m2	106.0 m2					
	Z3. Mechanical (Service)	784.0 m2	144.0 m2	146.0 m2	118.0 m2	141.0 m2	102.0 m2	62.0 m2	1298.0 m2					
	Z4. Building Service/Custodial													
	Washrooms	34.0 m2	262.0 m2	225.0 m2	225.0 m2	224.0 m2	70.0 m2	70.0 m2						
	Custodial	0.0 m2	Included	Included	Included	Included	Included	Included						
B	Non-Assignable Space	1468.3 m2	2289.1 m2	1578.5 m2	1665.7 m2	1961.6 m2	800.6 m2	797.6 m2	1456.3 m2					
C	Gross Areas by Level (Assignable + Non)	3109.5 m2	6782.1 m2	5612.5 m2	5053.7 m2	5299.6 m2	2281.6 m2	2278.6 m2	1456.3 m2					
Component Gross Up by Level														
	(Based on UofA's Pre-Programming Document - 30% Gross Up)													
	Programmed Area	0.0	850.2 m2	924.6	885.3	927.9	431.7	431.7	0.0 m2					
	Welcome Centre	0.0	57.3 m2	0.0	0.0	0.0	0.0	0.0	0.0 m2					
	Shared Space	0.0	0.0 m2	53.1	74.1	73.5	12.6	12.6	0.0 m2					
	SLOWPOKE	134.2	43.8 m2	0.0	0.0	0.0	0.0	0.0	0.0 m2					
	Subtotal Component Gross-up	134.2 m2	951.3 m2	977.7 m2	959.4 m2	1001.4 m2	444.3 m2	444.3 m2	0.0 m2					
D	Component Net by Level	2975.3 m2	5830.8 m2	4634.8 m2	4094.3 m2	4298.2 m2	1837.3 m2	1834.3 m2	1456.3 m2					
E	Building Gross Areas (Revit-Measured)	3122.3 m2	6782.1 m2	5612.5 m2	5380.8 m2	5299.6 m2	2386.6 m2	2050.2 m2	1456.3 m2					
E/A	Building Gross/Net Assignable Ratio	1.90	1.51	1.39	1.59	1.59	1.61	1.38	n/a					

3. Design Concepts



3.6 VERTICAL CIRCULATION

The Dentistry Pharmacy Building will have vertical circulation provided in a number of ways.

- 4 passenger elevators (one acting as well as a service elevator).
- 1922 Building circulation stairs.
- exit stairs located in all buildings.
- possible atrium stairs to suit future program requirements.

The elevators serve all program levels of the building with the service / passenger elevator serving the basement and penthouse levels with security provisions.

Once additional program development has been done an analysis can be completed using actual building populations to finalize service levels provided. The VERTECH Elevator Services Inc. report dated October 5, 2012 provides more details of the proposed building elevator system.

3.6 Vertical Circulation

1. SUMMARY

The purpose of this report is to present the options available and rationale for a recommended new elevator type and size for the four (4) new elevators proposed for the Dentistry Pharmacy Building Redevelopment project at the U of A North Campus. The report provides preliminary information on the recommended type and size of elevator and identifies a budget and preliminary schedule to assist with planning the work.

2. EQUIPMENT REQUIREMENTS

Based on plans provided and information discussed we understand that portions of the building would be demolished and new central atrium constructed to connect the floor levels of the various existing building wings. A central grouping of elevators is proposed comprised of a four car group. One car would be arranged as a service elevator to serve a dual purpose as both a passenger elevator that operates with the group and also as a service elevator when needed for dedicated service purposes.

The building would be comprised mainly of offices and administration functions on the upper floors with the exception of the 1st and 2nd floor levels where there would be some assembly uses, lecture theatre, council chambers, etc. The 1st floor level would have exterior access and be the main atrium level and the 2nd floor level would also be accessed directly from the exterior at the formal front (heritage entry). It is assumed that the higher occupant floors at the lowest levels would be connected and provided with large open stairs and that the majority of the traffic in and out of the building and to the lower floor levels would occur via the stairs and that the elevators would be used primarily by the users and occupants of the upper floor offices and administration areas on the lower floors and not by the general student populations.

Current plans show a group of four (4) elevators arranged in a group of three with a single car across the corridor from the southernmost elevator. The proposed configuration appears to satisfy the vertical transportation needs of the facility and this report provides further detail to refine the equipment selection. We understand that the U of A have confirmed that freight elevators would no longer be required in the building and that dual use passenger / service elevator with a capacity rating of approx. 5000 lb. would satisfy the buildings service requirements.

Elevator ID numbers should be assigned by the U of A as the project moves forward to reality and for the time being the numbers #1,2,3 & 4 are being used as shown on the Stantec drawings and sketches provided.

The following is a vertical representation of the elevators showing the floors served and elevations.

Floor Level	Elevation	Passenger Elevator #1	Passenger Elevators #2 & 3	Passenger / Service Elevator #4
Elevator Machine Room	TBD			
Level 7 Mechanical	125602			■
Level 6	121335	■	■ ■	■
Level 5	117068	■	■ ■	■
Level 4	112801	■	■ ■	■
Level 3	108534	■	■ ■	■
Level 2	104267	■	■ ■	■
Level 1	100000	■	■ ■	■
Basement	96647			■
Total Rise				

■ - Front Opening,

The proposed new elevators will need to satisfy the Alberta Building Code requirements for accommodating a mobile stretcher and therefore this report will suggest an elevator size suitable for this and other purposes.

3. NEW ELEVATOR OPTIONS

The primary code considerations would be meeting the Barrier Free Access requirements of the building code as well as meeting the building code requirement for accommodating a mobile stretcher. In addition to these minimum code requirements the proposed elevators should be adequately sized to allow for the movement of mobility impaired persons, public, staff, equipment, furniture and other equipment or materials in the building periodically.

A service type elevator that can also accommodate passengers is proposed for one of the new elevators and the other passenger elevators are proposed as standard sized passenger type elevators to satisfy the code requirements stated above as a minimum. The service elevator would satisfy the building code stretcher access requirements and therefore the other elevators would not have to comply with those requirements.

A passenger rated elevator does not have any restrictions on its use other than it cannot be used for moving heavy concentrated loads and it cannot be loaded using a forklift or other industrial truck type equipment. The proposed service elevator would have a larger capacity but would still have the same restrictions on how it is loaded and the weight of any single item or concentrated load should not exceed 25% of the capacity rating of the elevator. The service elevator design would be based on these loading criteria and restrictions and if this is not adequate then a different type of elevator or one with a higher class of loading would need to be considered at additional cost to the project.

The following sections and options deal with the various options and types of passenger and service elevators and sizes available.

3.1. Passenger/Service Elevator Types

The rise and speed requirements are too great for the use of hydraulic type elevators and therefore traction type elevators would be required. The area above the main elevators is available as machinery space and therefore a conventional arrangement with a machine room above the elevator hoistway is recommended. This arrangement has many benefits and it would allow the majority of the elevator equipment to be located in one easily accessible area to facilitate on-going maintenance, repair and servicing without impact the occupants of the building significantly.

The service elevator is proposed to have an additional stop at the uppermost mechanical penthouse level and therefore the hoistway for that elevator would need to extend up further into the building. For the service elevator the equipment could be arranged in a machine-room-less (MRL) arrangement to eliminate the need for a separate machine room above the service elevator hoistway. The control equipment for the service elevator could be located in the elevator machine room for the passenger elevators such that all of the control equipment is in a common area to facilitate on-going care and access. The machinery for the service elevator could be accessed and maintained from the 7th floor mechanical penthouse level which should not impact the occupants of the building significantly.

All elevators should serve all upper office floors and main landings with the exception of the upper mechanical space on level 7 and the basement floor which could be served only by the passenger/service elevator. This arrangement would be acceptable provided the use to the basement and mechanical floor would be light and occasional only. A feature to call the passenger/service elevator at selected floors could be provided for calling that elevator when it is necessary to access the basement or mechanical levels.

Regardless of the arrangement of the traction elevators (MRL or in a machine room) the equipment should be specified as high efficiency traction elevator products with gearless machines, regenerative drives and permanent magnet AC hoist motors to ensure an environmentally friendly design.

The recommended speed of the elevators would be between 350 to 500 fpm and the service elevator could be arranged at the low end of this speed range due to its higher capacity requirements and the passenger elevators at the upper end of this speed spectrum for additional performance and efficiency of passenger movement. These arrangements/speeds would be similar to the new elevator equipment provided at the U of A Edmonton Clinic North project for comparative purposes.

The elevators would require a machine room located above the hoistway that would be approx. 1.5 times the size of the hoistways below plus some additional space for the controls for the passenger/service elevator.

3.2. Passenger & Service Elevator Size

Passenger & service elevators come in a number of “standard” sizes but can also be custom made if necessary. A standard size is recommended, if possible, to keep the equipment costs down and delivery as short as possible.

Standard Passenger & Service Elevator Sizes and Dimensions		
Capacity	Clear Cab Inside Dimensions	Door Opening Size
2500 lb. (1135 kg) Pass.	2030 x 1295	1070 x 2135
3000 lb. (1365 kg) Pass.	2030 x 1450	1070 x 2135
3500 lb. (1590 kg) Pass.	2030 x 1650	1070 x 2135
4500 lb. (2045 kg) Service	1740 x 2415	1220 x 2135 (2440 high optional)
5000 lb. (2270 kg) Service	1740 x 2590	1370 x 2135 (2440 high optional)

- All capacities shown meet the building code stretcher requirement with a side opening door.
- Highlighted rows show the recommended sizes for this project.

The Passenger/service elevator would satisfy the building code stretcher requirements therefore the other elevators do not have to meet these requirements. The existing elevator hoistway is intended to be reused to accommodate two of the new passenger elevators and its size may limit the selection of the capacity rating and internal dimensions for the #2 & 3 passenger elevators. Preliminary review suggests that the existing hoistway will accommodate two (2) standard 3000 lb. capacity elevators without alteration provided adequate support (divider beams or equivalent) can be provided for the attachment of rails as the total width of the hoistway is somewhat wider than required for the new elevators. With some alteration to the front to back dimension of the hoistway the shaft could likely accommodate two (2) standard 3500 lb. capacity elevators as well.

As a minimum we recommend that the new elevators have the following capacity ratings:

New Elevator Numbers	Minimum Capacity Rating
Passenger Elevator #1	3500 lb.
Passenger Elevators #2 & 3	3000 lb. (option for 3500 lb.)
Passenger/Service Elevator #4	5000 lb.

4. ELEVATOR MACHINE ROOM, HOISTWAY, PIT & OVERHEAD REQUIREMENTS

To accommodate a standard sized passenger/service elevator a suitable hoistway will need to be provided.

The following approximate dimensions would be required to accommodate new “standard” sized new equipment from various common suppliers. The approximate sizes would accommodate high efficiency gearless traction elevators in a machine room configuration from various manufacturers. The dimensions provided for the passenger/service elevator are based on a machine-room-less (MRL) arrangement to allow the elevator to serve the additional floor at the top of the building.

Standard Passenger/Service Elevator Requirements				
Capacity / Type	Approximate Hoistway Size	Pit Depth	Overhead Clearance (measured to underside of machine room floor slab for passenger elevators and to underside of hoist beam at the top of the shaft for the MRL service elevator)	Machine Room Required
Passenger Elevator #1 - 3500 lb. (Passenger) Front Only with Rear Counterweight	2540 x 2390	2080	5080	Approx. 1.5 times hoistway size directly above the hoistway
Passenger Elevators #2 & 3 (In existing hoistway) Option 1 - 3000 lb. (Passenger) Front Only with Rear Counterweight	5182 x 2185 (existing hoistway size is approx. 5867 x 2243)	2080	5080	Approx. 1.5 times hoistway size directly above the hoistway
Passenger Elevators #2 & 3 (In existing hoistway) Option 2 - 3500 lb. (Passenger) Front Only with Rear Counterweight	5182 x 2390 (existing hoistway size is approx. 5867 x 2243)	2080	5080	Approx. 1.5 times hoistway size directly above the hoistway
5000 lb. (Service) Front Doors Only	2565 x 3100	1805	5325	Approx. 3 m ² space in the passenger elevator machine room for MRL traction elevator controls

Note - overhead clearance for the passenger elevators is based on a 9'-0" cab height and a 10'-0" cab height for the service elevator to meet the U of A Design Guidelines. This higher than normal cab would be appropriate for moving equipment, materials & furniture periodically over the life of the building.

The foregoing table shows the hoistway size requirements for the various elevator classification/sizes with front openings only. NOTE: the existing hoistway size is not deep enough to accommodate the Option 2 3500 lb. capacity elevators without some alteration.

For the passenger elevators the main structural loading would rest on a structural machine room floor slab which would need to be constructed over the elevator hoistways. Other support would be required in the hoistway for the rail attachments at the side and rear walls. A hoist beam is also required for the passenger elevators and would be located in the machine room directly above the hoistways that lie below.

For the MRL traction passenger/service elevator the main structural loading is transmitted down to the pit floor with the exception of the rail attachments and forces on the side walls. A hoist beam is also required at the top of the hoistway for installation and future maintenance, servicing and repair. Some MRL traction designs may require additional structural support at the top of the elevator hoistway in the form of pockets for supporting beams or structure and this will not be known until vendor and product selection is determined.

Rail bracketing support is required in the pit, at floor levels and in the overhead. A concrete hoistway is typically preferred, however, other construction is possible if preferred for various reasons. In this case we understand that the existing hoistways in a portion of the building which are cast in place concrete would be retained and reused. Rough openings in the concrete hoistway are required and the entire front and/or rear wall of the hoistway should be left open it's full width where elevator doors are to be located. The height of these rough openings should be minimum 2390 - 2440 mm for 2135 high doors. Masonry infill would need to be installed around and above the door frames once they are placed in the rough opening.

New hoistways for additional elevators may be of steel construction in which case the placement and design of the steel would need to consider the elevator support and rail attachment requirements. Drywall or other approved methods would be required to complete the steel hoistway enclosure and to provide the required fire rating if required by the Building Code.

The elevator pit should be constructed of concrete and needs to extend below the bottom floor level to a minimum depth as indicated above depending on the supplier selected. If possible the pits for the passenger elevators that do not serve the basement floor could be placed at the basement floor elevation with walk-in access doors at that level to avoid having to access the pits from the bottom elevator floor landing.

The U of A Elevator Design Guidelines and latest elevator safety codes require that all elevators be equipped with fire recall operation (firefighter’s emergency operation) and the elevator safety code will therefore also require each elevator to be provided with a pit drain to meet the elevator safety code requirements. Any sumps or sump pumps that may be required from the drain should be located outside of the elevator pit and should not be accessed from the elevator pit if possible.

The fire alarm system in the building will have to be interfaced with the elevator controls to satisfy the latest code requirements and to initiate automatic recall of the elevators under the various circumstances required by the elevator safety code. Smoke detectors for initiating recall must be installed at each elevator landing, in the top of hoistway & machinery space and in the elevator machine/control room. It may also be acceptable for an atrium smoke sensing system such as VESDA to initiate recall of the elevators from atrium spaces if applicable but this may require approval from the elevator regulatory authority (AEDARSA).

An unobstructed overhead clearance is required in the elevator hoistway as shown in the table and this is measured from the top floor level to the underside of the hoist beam that would be required in the top of the shaft for the MRL passenger/service elevator and to the underside of the structural machine room floor slab for the passenger elevators in a machine room configuration.

The traction elevator equipment will produce some heat and the machine room would need to be provided with HVAC to maintain the environment at a suitable temperature at all times. For the MRL elevator there is also some heat produced in the top of the hoistway and some ventilation for the top of hoistway machinery space is also required for the passenger/service elevator (this can likely be connected via a vent to the adjacent machine room space for the passenger elevators).

Three phase power would be required for the elevators and an appropriate electrical service would need to be provided to suit the needs of the new elevator equipment. The power would be required in the combined machine/control room at the top of the building for all four (4) of the elevators.

The approximate motor horsepower size would be as follows:

Elevator #/Description	Capacity/Speed	Approx. Motor HP Rating
Passenger Elevator	3000 lb. @ 500 fpm	30 hp each
Passenger Elevator	3500 lb. @ 500 fpm	35 hp each
Passenger/Service Elevator	5000 lb. @ 350 fpm	35 hp

The machine/control room needs to be fire separated from the remainder of the building.

5. SCHEDULE, BUDGET & SUPPLIERS

Typically a lead time of approximately 14 - 18 weeks is required for the manufacturing and delivery of the elevator equipment from the time shop drawings are approved. The time to install each elevator would be approx. 10-12 weeks once the hoistway and machine/control room is ready with electrical power in place.

New elevators with features and finishes in accordance with the U of A Elevator Construction Guidelines would have the following approximate budget costs (excluding related work, electrical, hoistway and associated construction, GST, etc.):

Type / Size of Elevator - 4 stops	Approximate Elevator Budget Cost
Passenger Elevator 3000 lb front only	\$200,000.00 each
Passenger Elevator 3500 lb front only	\$210,000.00 each
Passenger/Service Elevator 5000 lb front only	\$250,000.00

The additional and associated construction costs for construction of the pit, hoistway, overhead and machine room or control space, electrical power, fire alarm interface, miscellaneous electrical items, mechanical work and miscellaneous finishes such as elevator cab flooring would have to be added to these figures.

A number of elevator contractors can provide traction elevator equipment of the type suggested including Otis, Schindler, KONE and ThyssenKrupp.

6. RELATED WORK BY OTHER TRADES

The following work will have to be performed to accommodate the new elevator equipment and to complete the installation. The elevator contractor does not normally perform this work and the following items will need to be coordinated and completed by other trades.

Civil, Structural, Miscellaneous Work

- I. A hoistway enclosure will need to be constructed for the elevator with support for rail brackets as required by the elevator contractor. Rough openings will be required for the installation of the elevator door frames and the rough openings will need to be filled in once the door frames are set.
- II. For the passenger elevators a structural machine room floor slab is required.
- III. The pit and pit floor should be constructed of cast in place concrete.
- IV. A hoist beam would be needed in the machine room or hoistway overhead to suit the elevator contractor's requirements.
- V. Block in and grouting of the new elevator entrance frames and sills will need to be completed at each floor opening and finished flooring will be required to the elevator landing door sills.
- VI. A suitable machine room will need to be provided to suit the elevator supplier's requirements located directly above the passenger elevator hoistway. This room can also accommodate the control equipment for the #4 passenger/service elevator.
- VII. Small openings are required in the hoistway wall between the service elevator hoistway and the adjacent machine/control room as a minimum for the passage of electrical conduit and wire.
- VIII. Cutouts in the hoistway walls may be required for the mounting of elevator operating fixtures, push buttons, etc.
- IX. Finished flooring is required to be installed in the new elevator cabs.
- X. A metal pit ladder is required with handholds that extend at least 48" above the lowest floor in each pit.
- XI. Cab finishes would be per the U of A Elevator guidelines unless otherwise specified by the Architect/University.

Electrical Work

- I. A 3 phase power supply would be required for each elevator including a fused disconnect in the elevator machine/control room to suit the elevator motor and power characteristics. Emergency power for the elevator is requested by the U of A Guidelines and should be provided. As a minimum adequate emergency power will need to be provided to operate one (1) or more elevator at a time subject to the University's desires.
- II. Feeder wiring from the disconnect switch to each elevator controller is required.

- III. A 110 V power supply and fused disconnect is required in the elevator machine/control room for the elevator cab lighting power supply. Feeder wiring to each elevator controller is also required.
- IV. The machine room and pit needs to be provided with adequate lighting and a light switch. Fluorescent lighting is preferred and the pit fixture needs to be guarded against breakage.
- V. Lighting and an associated light switch, etc. is also required at the top of the shaft for the MRL passenger service elevator only.
- VI. 110 V power outlets are required in the pit and the elevator control room. Outlets are required to be of the GFCI type or the circuits equipped with GFI breakers.
- VII. Fire alarm interface signals are required to activate the firefighter's emergency operation of the elevator if provided/required. As many as four (4) separate signals may be required per elevator depending on the presence of water sprinklers in the various areas. Smoke detectors are required as part of the fire alarm system in the elevator lobbies, machine/control room, top of hoistway and pit (if required by the applicable codes). The provision of these signals is required whether the building is classified as a "high" building or not as these features are now required by the elevator safety code for all elevators regardless of building height.
- VIII. Telecommunications will be required in the elevator control room for use with the elevator communication equipment. The elevator communication equipment will likely be part of the U of A's "commend" intercom system.
- IX. Any security equipment, readers, etc. that may be required for restricting access to the elevator or various floors served by the elevator.
- X. Signals from the emergency power automatic transfer switch are required to each elevator controller for signaling the status of the elevator power supply source and for pre/post transfer operation of the ATS.

Mechanical Work

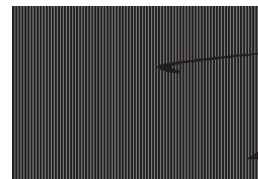
- I. The machine/control room above the passenger elevator hoistways will need to be adequately ventilated or cooled to remove heat generated by the equipment or other sources to maintain a reasonable operating temperature in the room.
- II. The machinery space at the top of MRL passenger/service elevator hoistway will also need to be ventilated or cooled to remove heat generated by the equipment in the top of the hoistway to maintain a reasonable operating temperature in this area.
- III. The elevator pit must be equipped with a pit drain and back flow valve per the B44 Elevator Safety Code requirements. A flow rate of 50 gpm per elevator is required.

7. RECOMMENDATIONS, INFORMATION REQUIRED

The following is a list of recommendations and information required to facilitate the design development and procurement of elevators for this building:

1. Standard sized passenger traction elevators with the equipment arranged in a machine room are recommended for elevators #1,2 & 3 to suit this application and to meet the U of A design guidelines.
2. For the passenger/service elevator a machine-room-less (MRL) traction elevator is recommended to allow the elevator to serve one additional floor at the top of the hoistway.
3. The hoistway, pit and overhead dimensions provided in the report are meant to be the maximum required to accommodate most suppliers and it may be possible to adjust (decrease) the dimensions somewhat prior to construction to suit the successful elevator supplier.
4. It should be determined if the existing hoistway would be altered to suit the larger 3500 lb. capacity elevator size required or whether the hoistway size should remain unchanged in which case the passenger elevators #1 & 2 could be provided with a 3000 lb. capacity rating. The 3000 lb. capacity elevators would likely suffice although the handling capacity of the group may be diminished somewhat by the smaller cab size. Further elevator analysis will be performed to study the impact of the size of the two (2) elevators that would be installed in the existing building elevator hoistway.

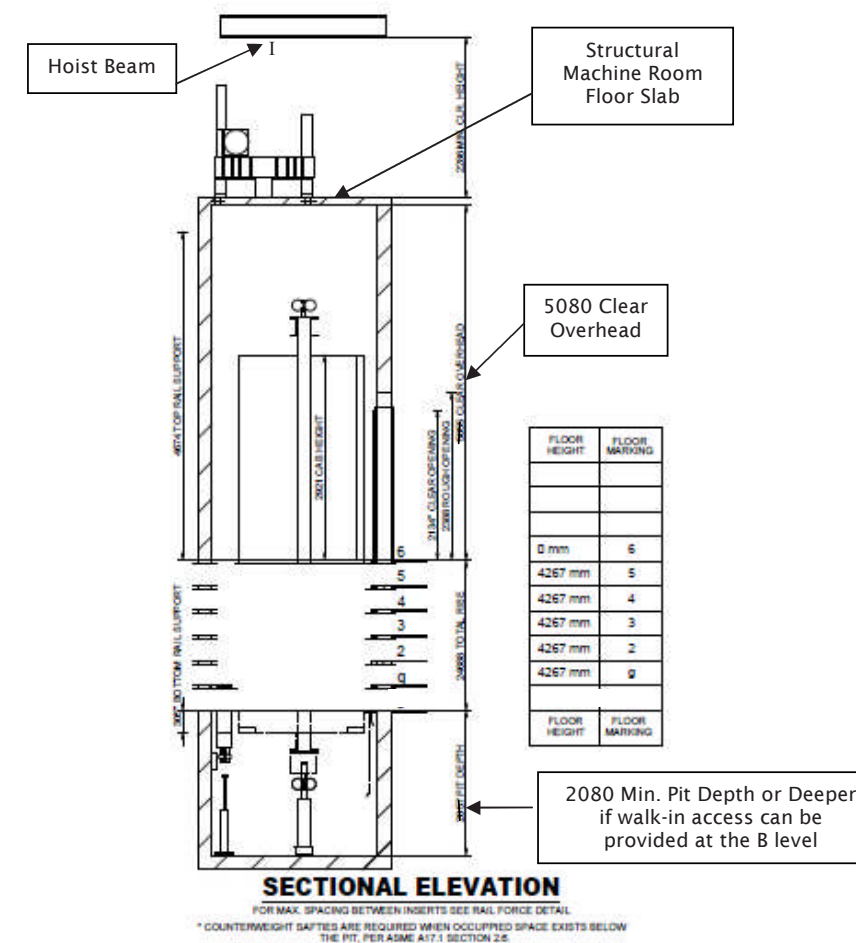
Report Prepared By:



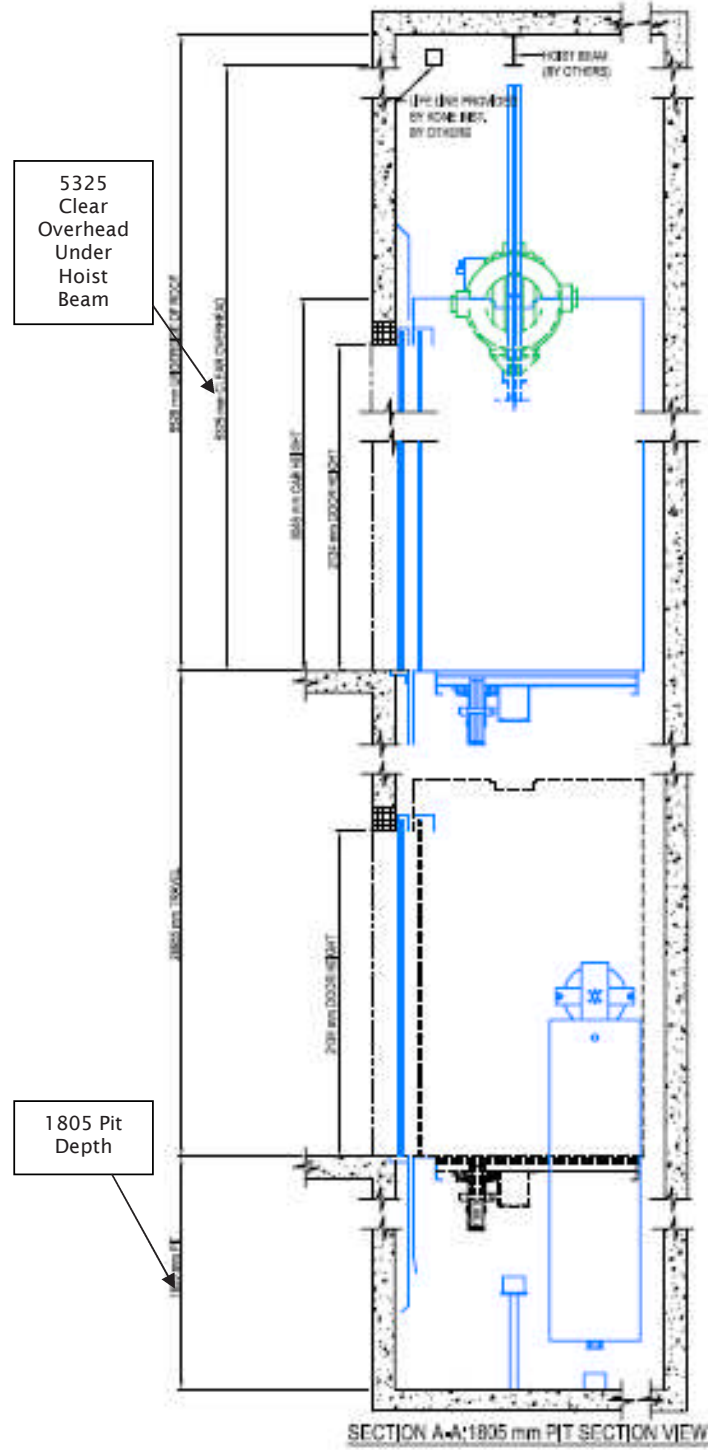
Raymond P. DeMeyer, P. Eng. (BC, AB, MB)

8. Attachments:

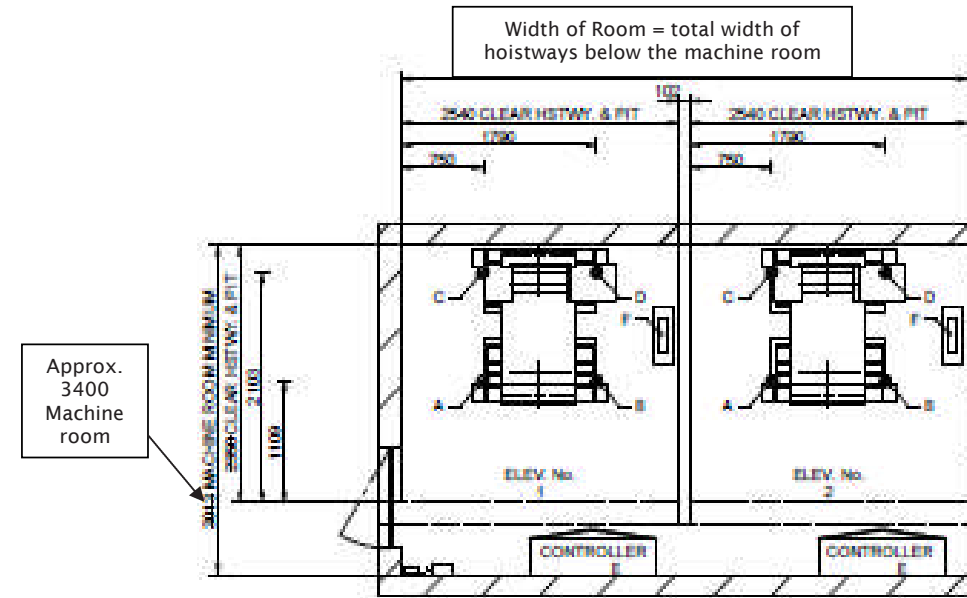
8.1. Attachment 1 – Sectional Elevation Through Passenger Elevator Hoistway, Pit and Machine Room. 3000 or 3500 lb. @ 500 fpm



8.2. Attachment 2 – Sectional Elevation Through Passenger/Service Elevator Hoistway, Pit and Machine Room. 5000 lb. @ 350 fpm



8.3. Attachment 3 – Approximate Machine Room Space (Typical Passenger Elevators)



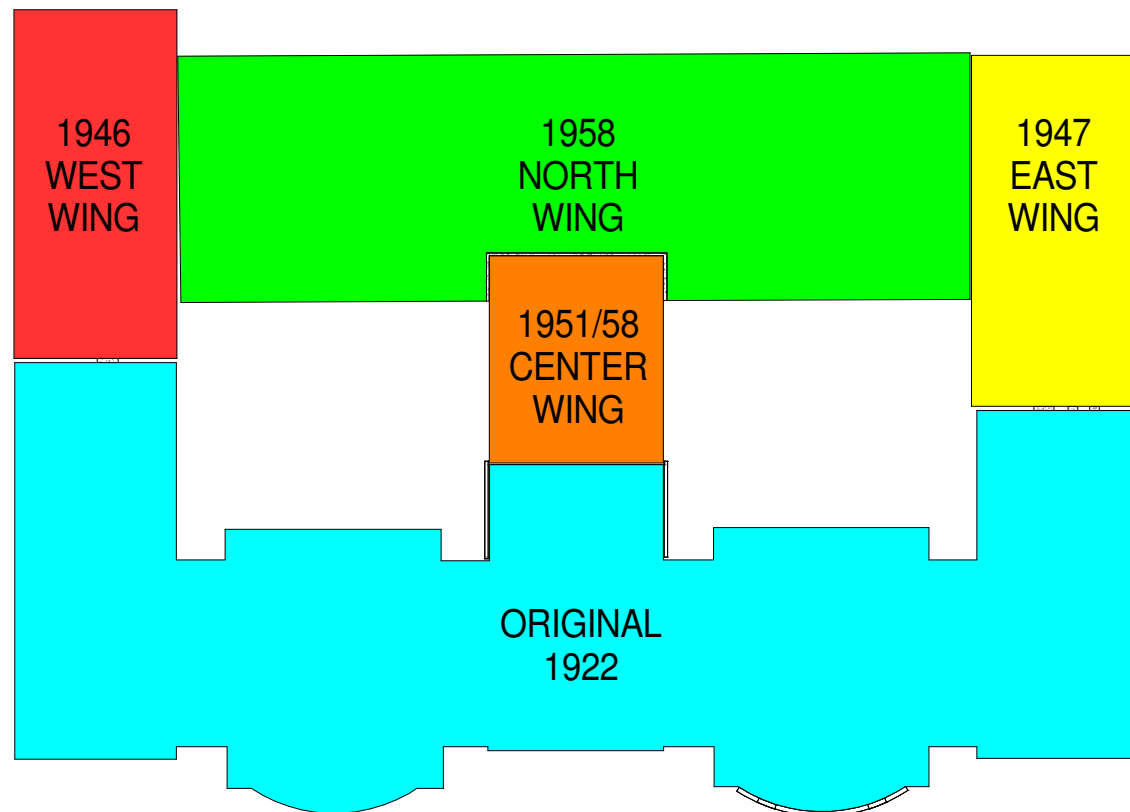
7.1 PROJECT DESCRIPTION

The structural design of the Dentistry Pharmacy Building involves the following principal elements:

- Modifications to the Existing Building
- Construction of a new Penthouse Level
- New Atrium within the building courtyard

This report summarizes the development of the structural schematic design for the above aspects of the project and incorporates findings from the investigation program.

7.2 KEY PLAN



7.3 DESIGN BASIS

The structural design of new elements on this project will conform to the Alberta Building code 2006 along with the material standards referenced in the code. For the existing building compliance will be referenced to Commentary L: Application of NBC Part 4 of Division B for the Structural Evaluation and Upgrading of Existing Buildings.

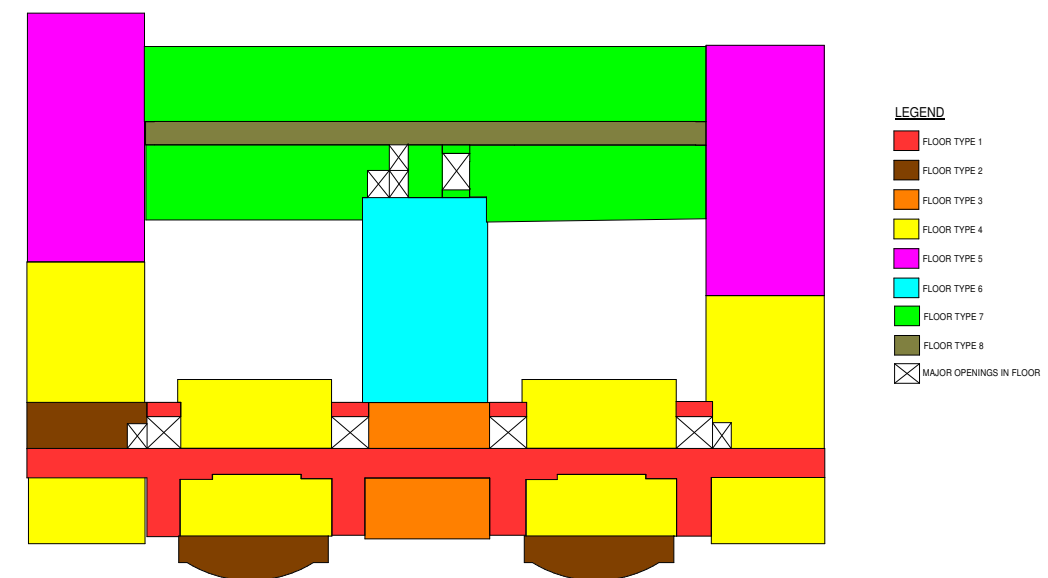
7.4 DESIGN BACKGROUND

Information on the construction of the existing building has been gained through the examination of archive drawings available for each of the existing buildings. This has been complimented by a selective investigation program that began in March 2012 and was completed in September 2012. This has allowed verification of drawn details, the observation of the condition of the building and the production of additional details that reflect the actual construction. This has been documented by both the structural and architectural teams and will be verified as we open up larger areas during the demolition phase of the project to understand the actual built condition.

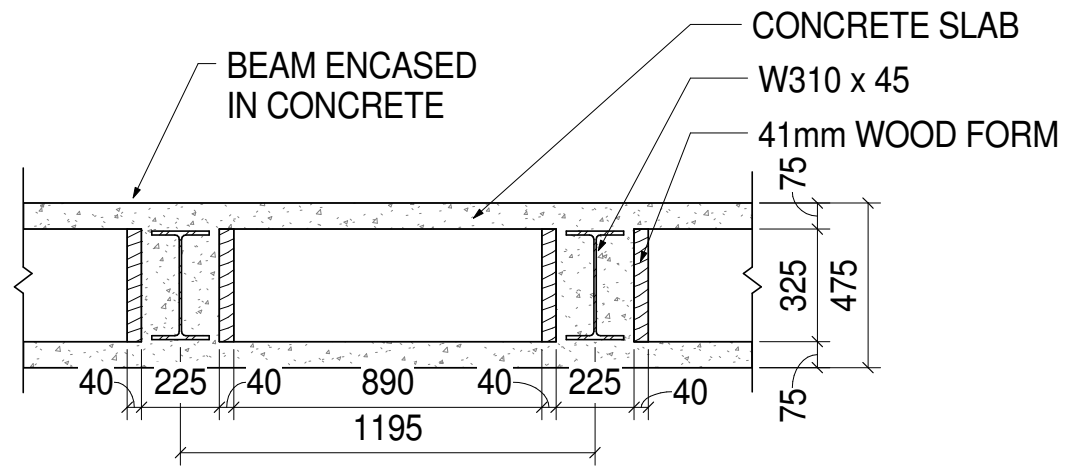
7.5 OBSERVATIONS FROM SELECTIVE DEMOLITION

.1 Floors

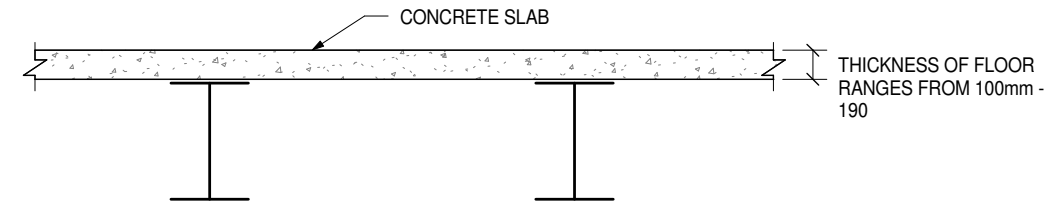
Across the building there are a number of floor assemblies reflecting the age of construction and building use. The extent of the floor types vary at each floor level. Full details are provided in Appendix S Structural drawings. We illustrate a typical floor level below with the associated assemblies following :



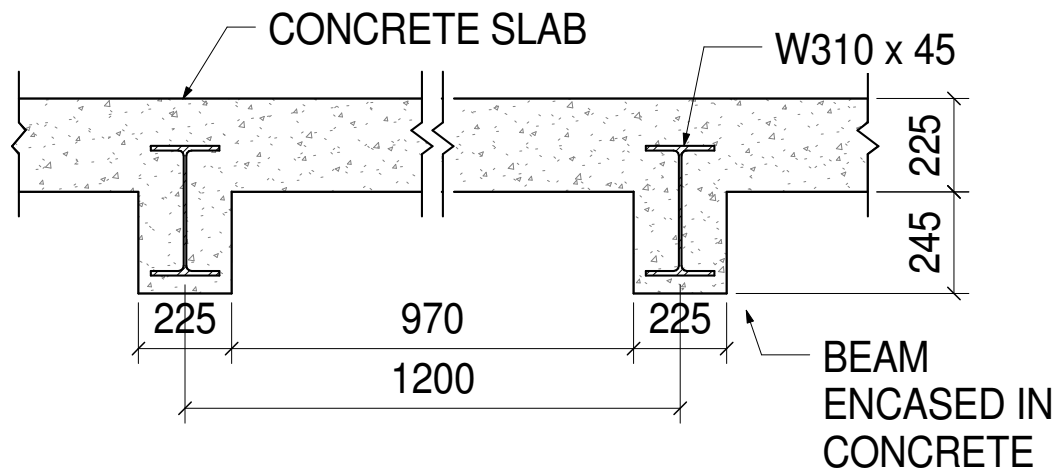
FLOOR TYPE PLAN



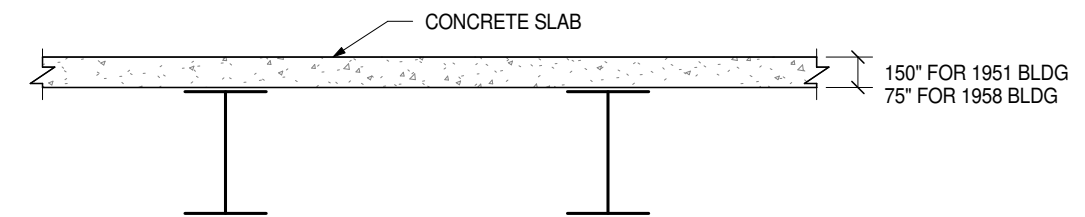
FLOOR TYPE 2



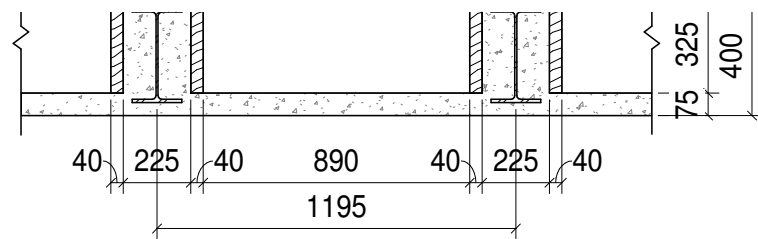
FLOOR TYPE 5



FLOOR TYPE 3



FLOOR TYPE 6



FLOOR TYPE 4

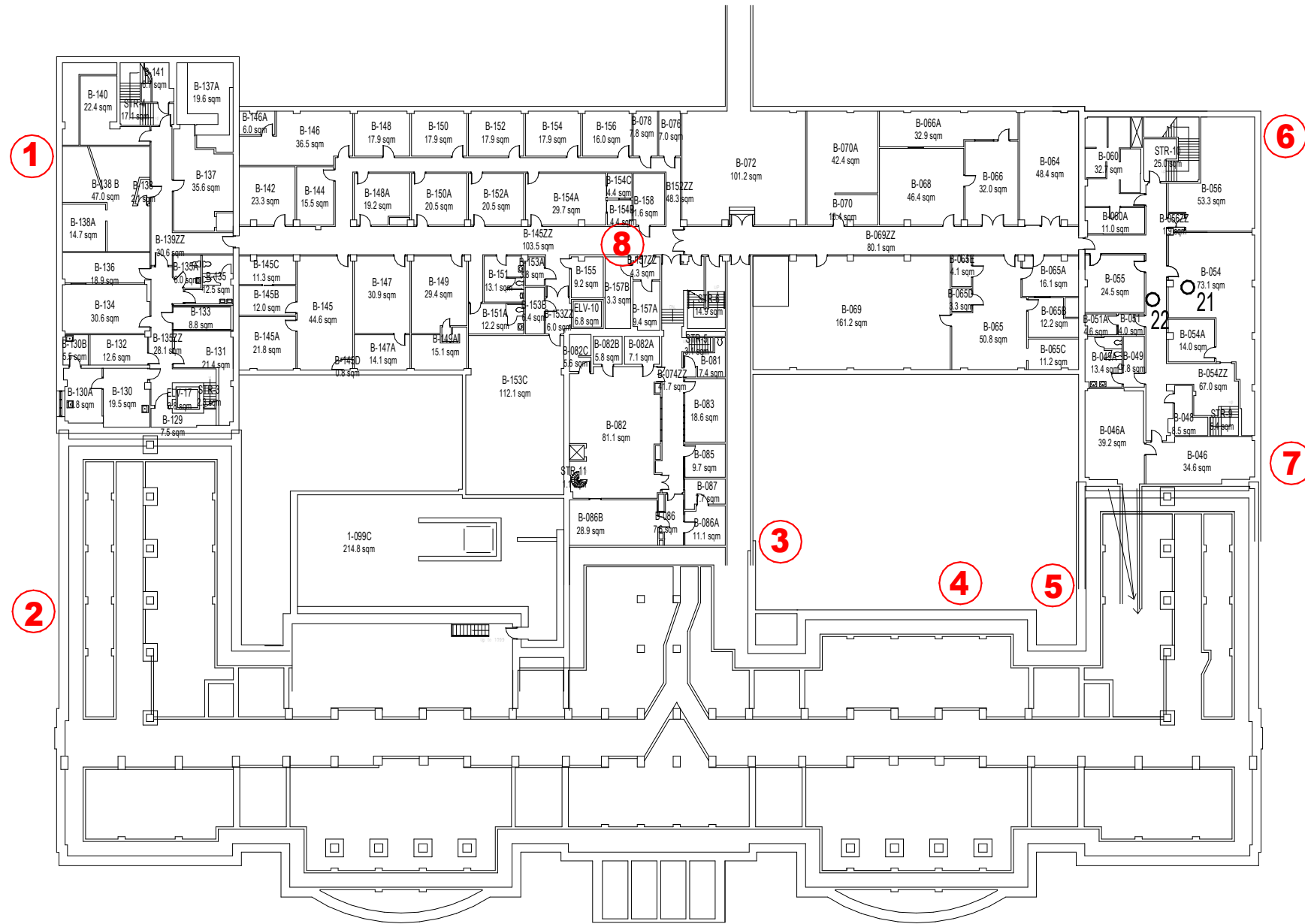
3.7 Structural Systems



3. Design Concepts

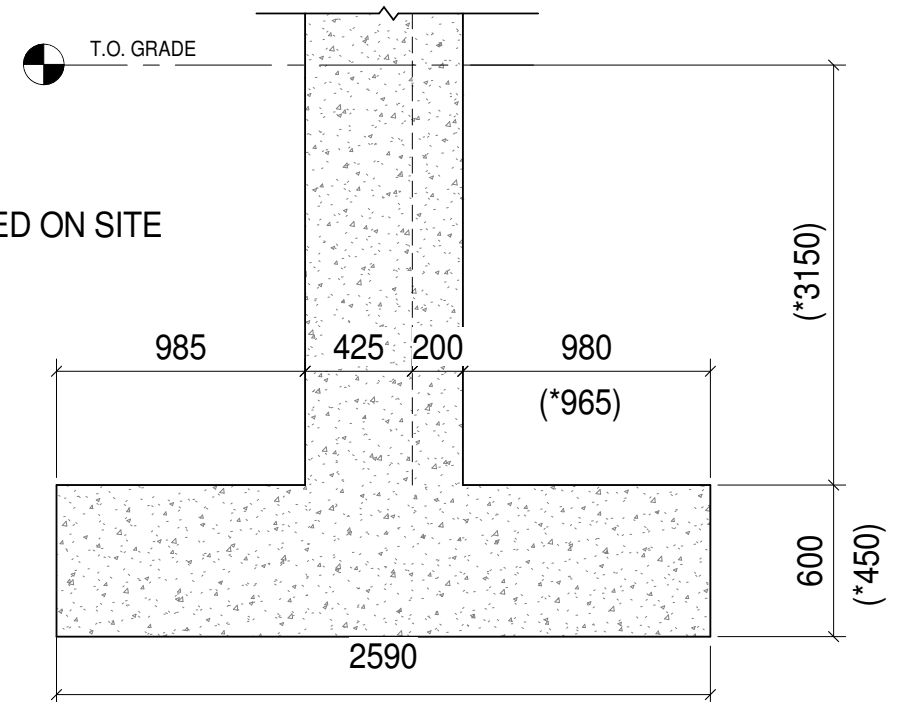
.2 Foundations

Trial pits have been dug and observed in 7 locations to confirm the foundation type and size. The foundations to the Original 1922 building are 1520mm wide strip footings founded 2355mm below ground level (b.g.l). The 1946, 1947 wings consist of a series of pad and strip footings. The pads are 2600mm square and located at each column position at a depth of 2250mm b.g.l. A 1520mm wide strip runs between the pads supporting the external wall of the building. The Center wing has a similar foundation scheme. The 1958 North Wing is a piled building with bored piles of 760 - 915mm diameter constructed to a depth 10.0m b.g.l at each column location. A basement wall runs between the piles.



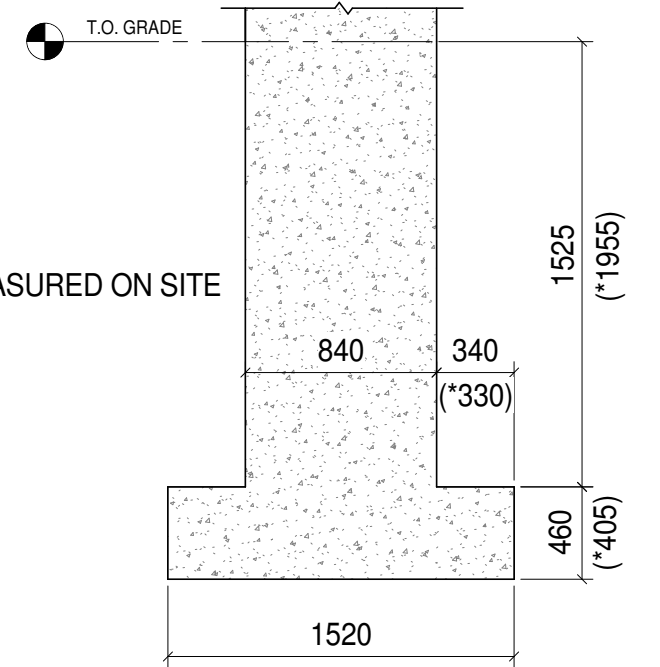
Foundation Level Plan

*DIMENSION MEASURED ON SITE

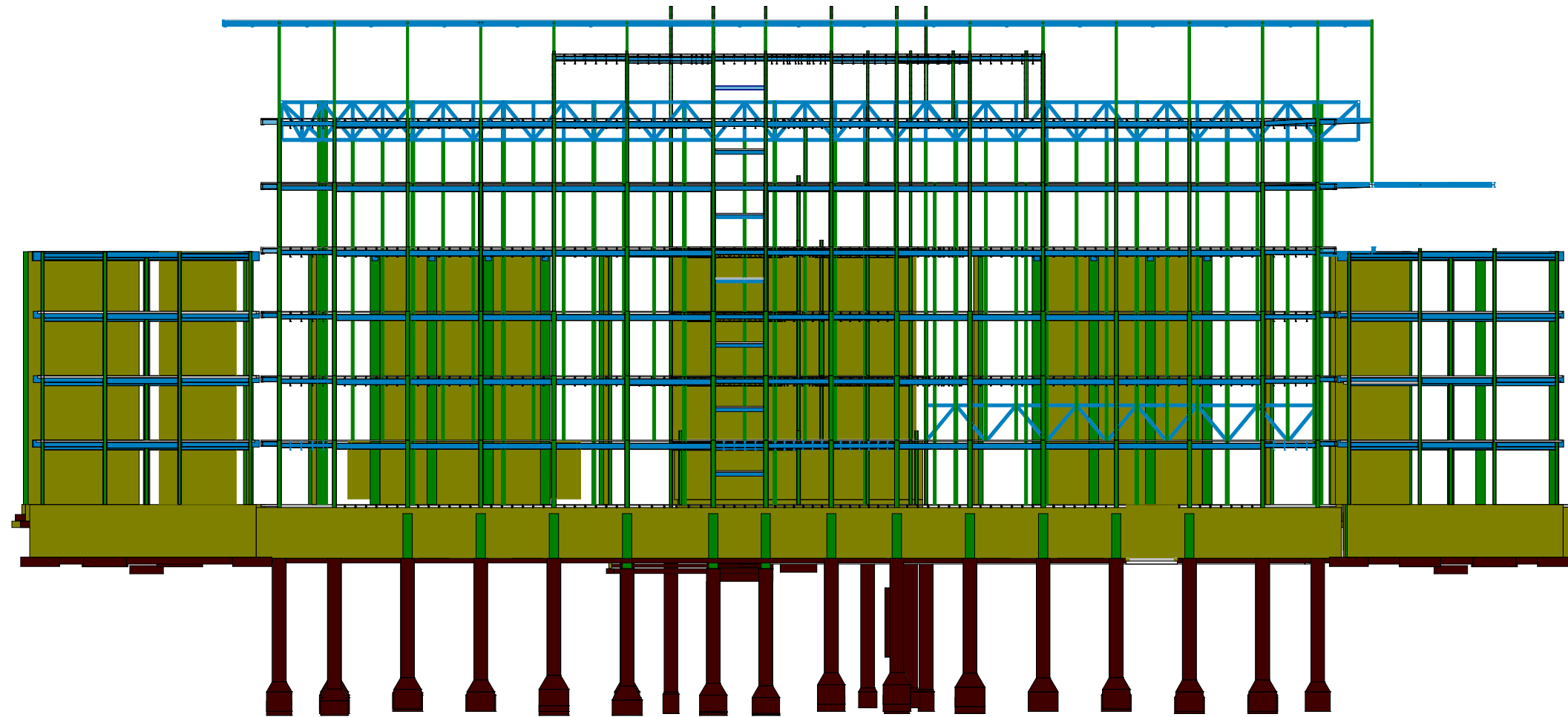


1 1946_1947 Foundation Detail at Column strip footing and concrete wall

*DIMENSION MEASURED ON SITE



2 1922 Foundation detail at Strip footing and concrete wall

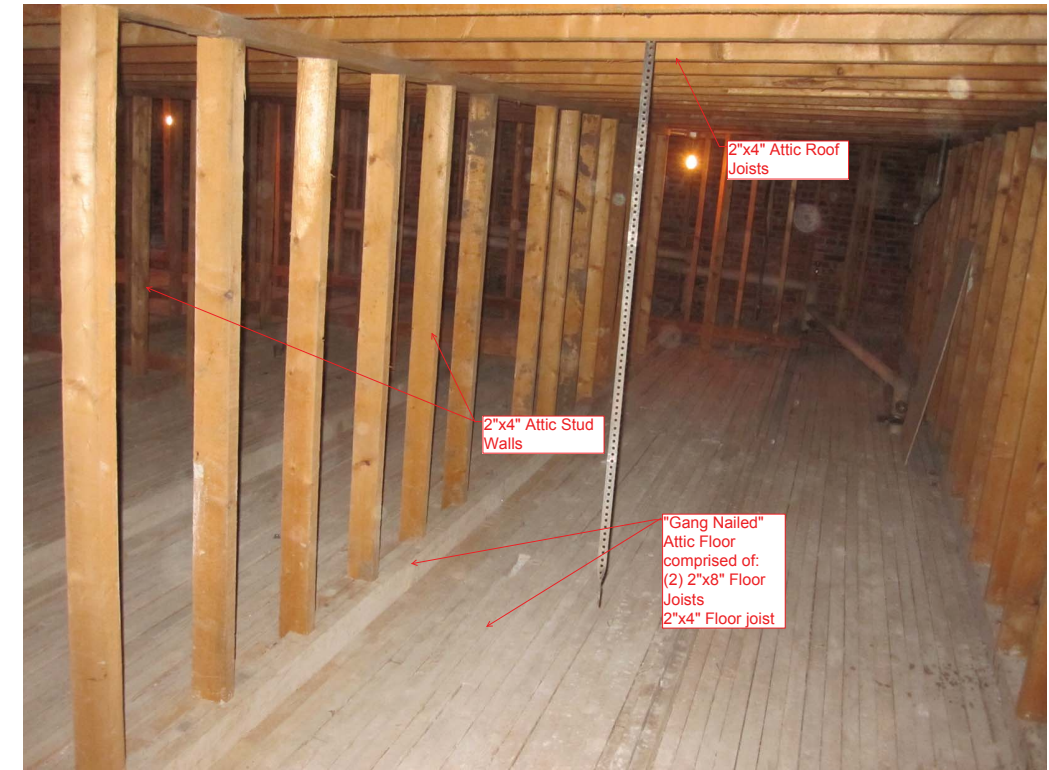


8 1958 Foundation detail rendering

.3 Walls

The walls to the building form an integral part of the structural support. The construction and function for each building is summarized in the table below:

Building	External Wall Construction	Function
1922 Building	Solid clay brick 315mm to 635mm thick	Load bearing walls Vertical support of floors and roof Lateral stability of building
1946 / 1947 Wings	100mm plastered terracotta Cavity 200-300mm clay brick	Lateral stability of building
1958	150mm concrete block Cavity 100mm clay brick	Non structural



Picture of 1920s Attic Space

.4 Roof

The roof structure consists of two prime elements the structure at roof level (the attic floor) and the structure above this level to the underside of the roof finish (the attic roof). The construction varies across the building and is described in detail below:

1922 Building

Attic roof

¾ "ship lap spanning onto 2"x4" roof joists spaced at 16" centres. The roof joists span between stud walls. In the centre of the building the roof form changes to a barn like frame.

Attic floor

Provides support to 2"x4" stud walls orientated to suit drainage lines of the attic roof. Floor consists of two 2"x8" wood joists nailed to 2"x4" floor decking. The wood joists are supported on steel beams that in turn carry the roof load back to the load bearing masonry walls.



Picture of 1920s "Barn like" Structure

1946 West wing and 1947 East wing

Attic roof

¾" ship lap spanning onto 2"x6" roof joists spaced at 16" centres. The roof joists span between stud walls.

Attic floors

Typically 4 ½" reinforced concrete slab spanning 4420mm between steel W beams that form part of the steel frame. The slab supports a more regular arrangement of stud walls which are spaced at 1500mm centres.



Picture of 1946/1947 Attic Space

1958 roof

The roof comprises of a 75mm thick reinforced concrete slab spanning 700mm between owsj's. The joists span 9625mm on to the main steel frame.



Picture of 1958 Roof Construction

Design Loads

The building has been assessed and designed where applicable to the following load criteria:

Climatic and Site Information

Importance Category – Normal
Snow Load, 1/50 – $S_s = 1.7 \text{ KN/m}^2$; $S_r = 0.1 \text{ KN/m}^2$
One Day Rain, 1/50 – 97 mm
Hourly Wind Pressure, 1/50 – 0.45 KN/m^2
Terrain – Rough
Site Classification – C

Gravity Loads

- Roofs
 - Snow Load – 1.46 KN/m² plus drifts, taking into consideration parapets and adjacent structures
 - Wind Uplift – To be determined based on design roof geometry
 - Live Load (other roofs) – 1.0 KN/m²
 - Superimposed Dead Load (other roofs) – 1.2 KN/m²
- Floors
 - Dead load to be determined based on individual floor type
 - Live Load (office areas) – 2.4 KN/m²
 - Live Load (other areas) – 4.8 KN/m²
 - Live Load (Penthouse) – 7.2KN/m²
 - Superimposed Dead Load including partition allowance – 1.5 KN/m²

7.6 Modifications to Existing Building

Basement Floor

Lower basement floor in 1958 building for new electrical room
Lower basement floor in 1958 building for extended mechanical room
Provide new access well into new electrical room
Provide new corridor link from 1946 building into 1958 building
Modifications to SLOWPOKE to connect to new SLOWPOKE laboratories
Accommodate new elevator pit arrangement

Level 1

Provide new corridor width openings in 1946 external wall
New loading dock on west elevation
Create new openings in south façade to facilitate access to Atrium
Demolish to Level 1 1951 / 1958 Centre wing
Modifications to existing elevator shafts

Level 2

Reposition north-south circulation corridor by infilling existing corridor opening and creating new opening in the revised location
Infill floor space if vertical shafts are not utilized

Level 3 / 4

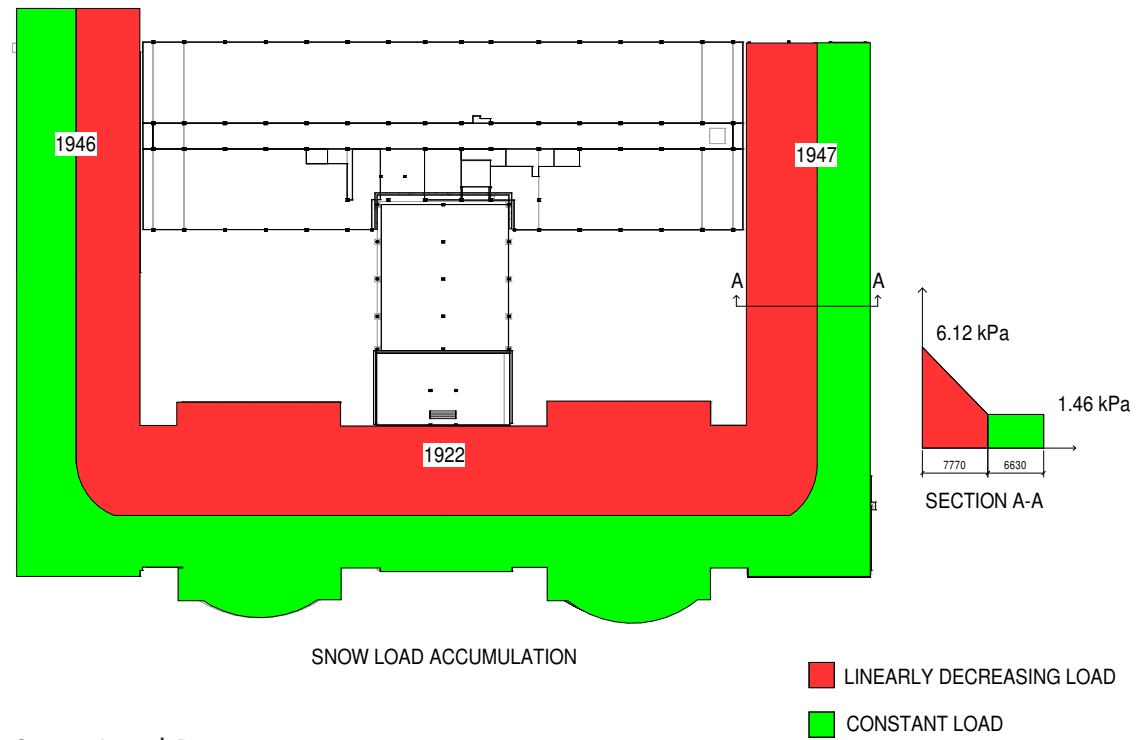
Reposition north-south circulation corridor by infilling existing corridor opening and creating new opening in the revised location
Infill floor space if vertical shafts are not utilized

Level 5

Provide link from new 1958 staircase to 1946 / 1947 staircases

Roof Upgrade

The new atrium structure will rise above the roofline of the 1922, 1946 & 1947 buildings. The change in roofscape between the new and old will cause snow accumulation to occur on the lower roof. The revised loading pattern is illustrated in the diagram below:



Snow Load Diagram

Following survey work to determine the actual roof construction the existing roof structure has been checked and requires strengthening to support the accumulated snow. This involves doubling roof joists, strengthening wood joists and re-building the 1946/1947 roof space. Details of the works required to strengthen the roof are provided in Appendix S Structural Drawings.

Level 6

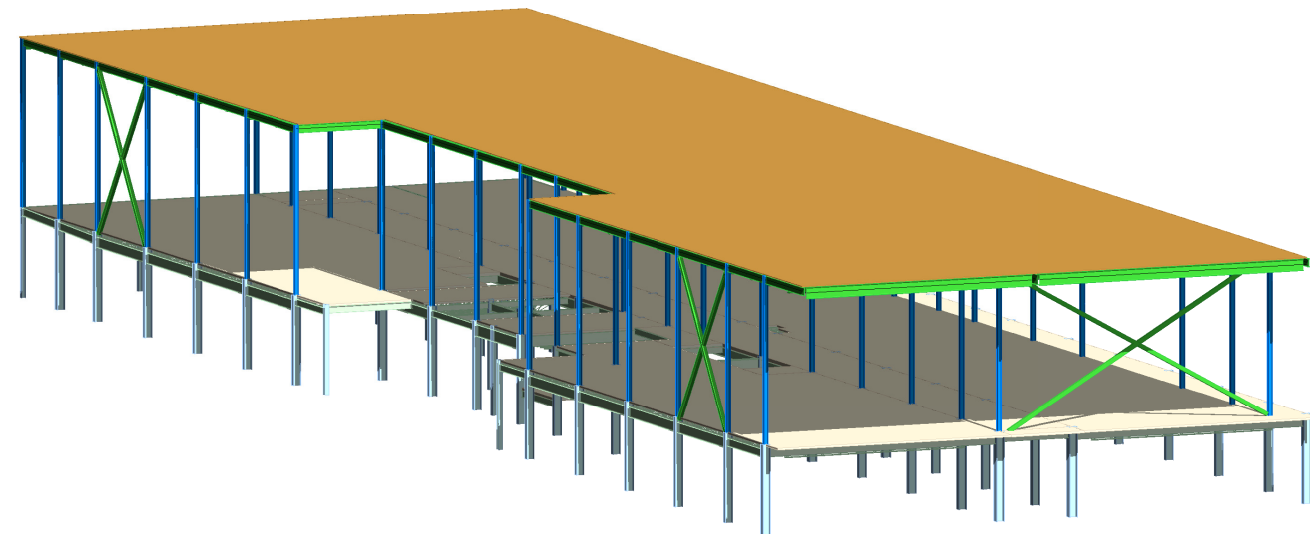
Provide staircase to level 5

Penthouse

Demolish existing kennel and roof structure and construct new Penthouse enclosure. The Penthouse will be set back from north façade and accommodate staircases at each end elevation to allow for vertical circulation to level 4. The proposed scheme is described in more detail below.

7.7 PENTHOUSE

The Penthouse enclosure has been designed to accommodate the proposed mechanical equipment and allow sufficient headroom to allow duct work to run unimpeded. The structure replaces the existing roof structure and therefore does not increase the vertical load on the building. The structure takes support from columns extended from the main frame of the 1958 building and frames the full length of the building with 2.5m cantilevers at each end elevation extending over the existing building perimeter. The roof structure will comprise of w beams to allow for support of mechanical services to the underside of the roof. Lateral loads are resisted by bracing in both directions. The basic framing is illustrated below.



Rendering of Plant Room

7.8 ATRIUM STRUCTURE

The atrium structure has been designed as a structure independent of the existing building. In this respect we do not use the existing building for support or for the transfer of lateral loads. This approach also allows us to overcome the constraints imposed by the presence of the Slow Poke within the Atrium footprint and develop a scheme that does not take support from the Slow Poke.

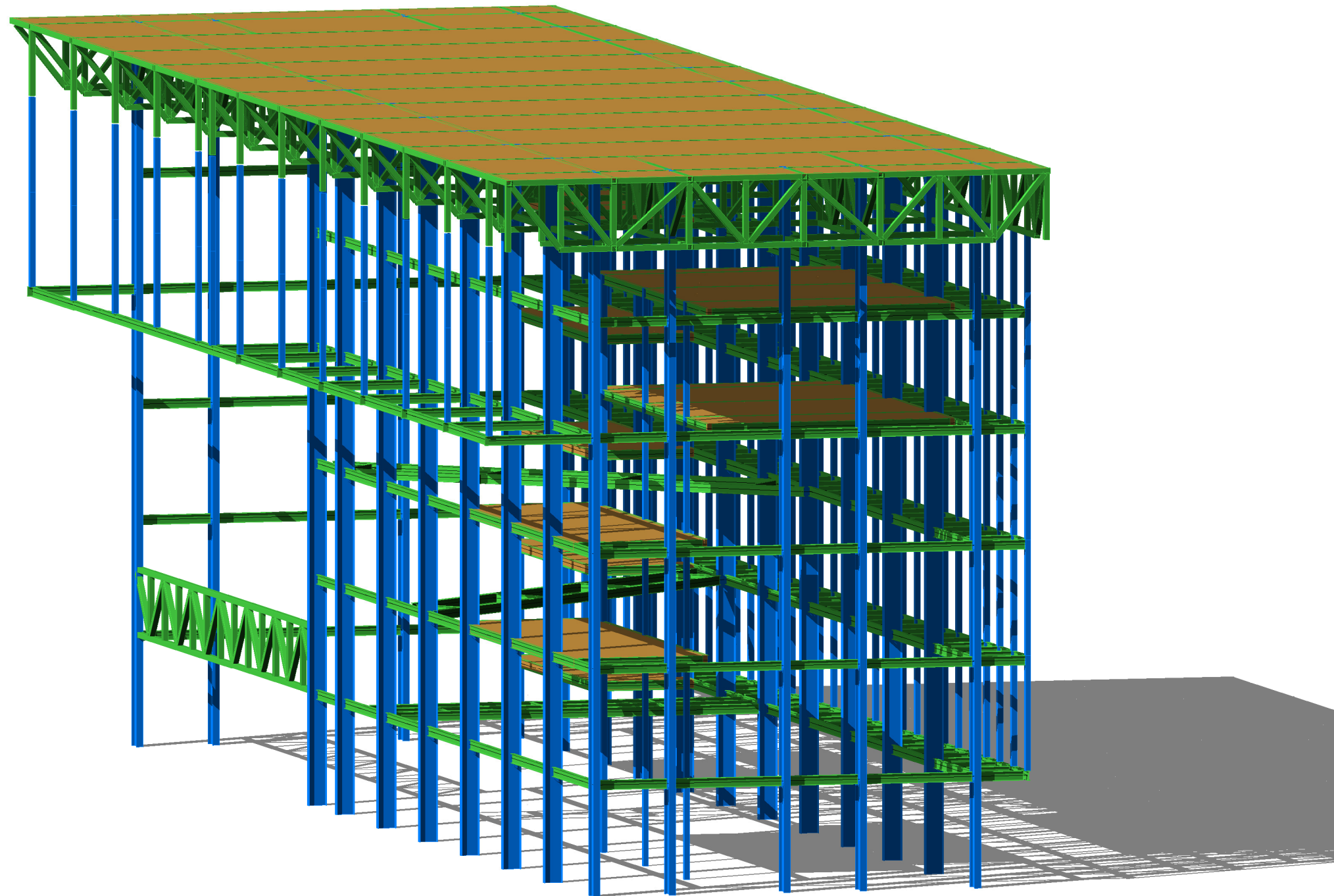
The atrium consists of a steel frame that rises 30m to support a diaphragm roof made up decking fastened to a series of owsj's spaced at 2000mm centres that are supported on primary steel trusses set out on a 6000mm grid. Stability is achieved by the provision of braced bays within the walls on all four sides of the atrium. These together with the roof plate act to transfer horizontal loads to the piled foundations. The Atrium includes a number of elements within the curtilage of the structural box these include bridges, offices and meeting places. Load allowances have been introduced on to the main frame for these and the individual components will be detailed further as we develop the design. The scheme is illustrated below with further details provide in Appendix S structural drawings.

(Coloured Render of Atrium Structure - Next page)

7.9 STRUCTURAL APPENDICES

The following Structural Drawings are in Appendix S:

- .1 Foundation Plan
- .2 Foundation Sections
- .3 Floor Type Plan
- .4 Floor Type Sections
- .5 Roof Remedial Measures
- .6 Mechanical Penthouse Rendering
- .7 Mechanical Penthouse Section
- .8 Atrium Structure Renderings



Coloured Render of Atrium Structure

8.1 GENERAL

The existing mechanical systems in the Dentistry Pharmacy Building will be removed in their entirety and replaced with new systems. During the construction process, only the SLOWPOKE lab and associated spaces will remain occupied. It will be mandatory to maintain the Slowpoke Reactor as a fully functional lab, 24/7/365 throughout all phases of construction.

New mechanical systems will be designed to meet the following goals:

- Meet the Program requirements.
- Meet the operational needs of Facilities and Operations.
- Provide cost effective and maintainable solutions that integrate with other design disciplines.
- Contribute to a healthy comfortable working environment.
- Contribute to sustainable solutions, consistent with Green Globe assessments.
- Provide life safety systems consistent with Alberta Building Code Requirements and applicable NFPA, ASHRAE, and CSA Standards.
- Provide mechanical systems consistent with the University of Alberta, Facilities and Operations, Design Guidelines.

8.2 MECHANICAL DESIGN CRITERIA

.1 Codes and Standards

Requirements from the following codes and standards will be incorporated into the mechanical design as they apply to this project.

- Alberta Building Code.
- U of A Facilities and Operations Design Guidelines.
- ASHRAE Standard and Guidelines.
- Standard 90.1 - 2007: Energy Efficient Design of New Buildings except Low Rise Residential Buildings.
- Standard 62 – 2010: Ventilation for Acceptable Indoor Air Quality.
- NFPA 13 – Installation of Automatic Wet Sprinkler System.
- NFPA 14 – Installation of Standpipe and Hose System.
- National Energy Code.

.2 Heating Systems

Load calculations have been carried out using Trane Trace 700 software to determine the building envelope heat loss. Load calculations have been based on the following peak heating load design conditions:

- Winter outside air temperature: -34°C.
- Indoor air temperature: 22°C ±1°C.
- Indoor relative humidity: 15%.

.3 Cooling Systems

Cooling load calculations have been carried out using Trane Trace 700 software to determine the building's peak cooling demand during summer conditions. Load calculations have been based on the following peak cooling load design conditions:

- Summer outside air temperature: 30°C dry bulb; 20°C wet bulb.
- Indoor air temperature: 21°C ±2°C.
- Indoor relative humidity: 15%.

.4 Office Spaces

Cooling load calculations have been carried out using Trane Trace 700 software to determine the building's peak cooling demand during summer conditions. Load calculations have been based on the following peak cooling load design conditions:

- Lights: 11.5 W/m²
- Computers: 250 W per workstation
- People: 73.2 W per person (sensible)
58.6 W per person (latent)

.5 Council Chamber

Cooling load calculations have been carried out using Trane Trace 700 software to determine the building's peak cooling demand during summer conditions. Load calculations have been based on the following peak cooling load design conditions:

- Lights: 11.5 W/m²
- AV: 1.5 kW
- People: 71.7 W per person (sensible)
30.7 W per person (latent)

.6 Meeting Rooms

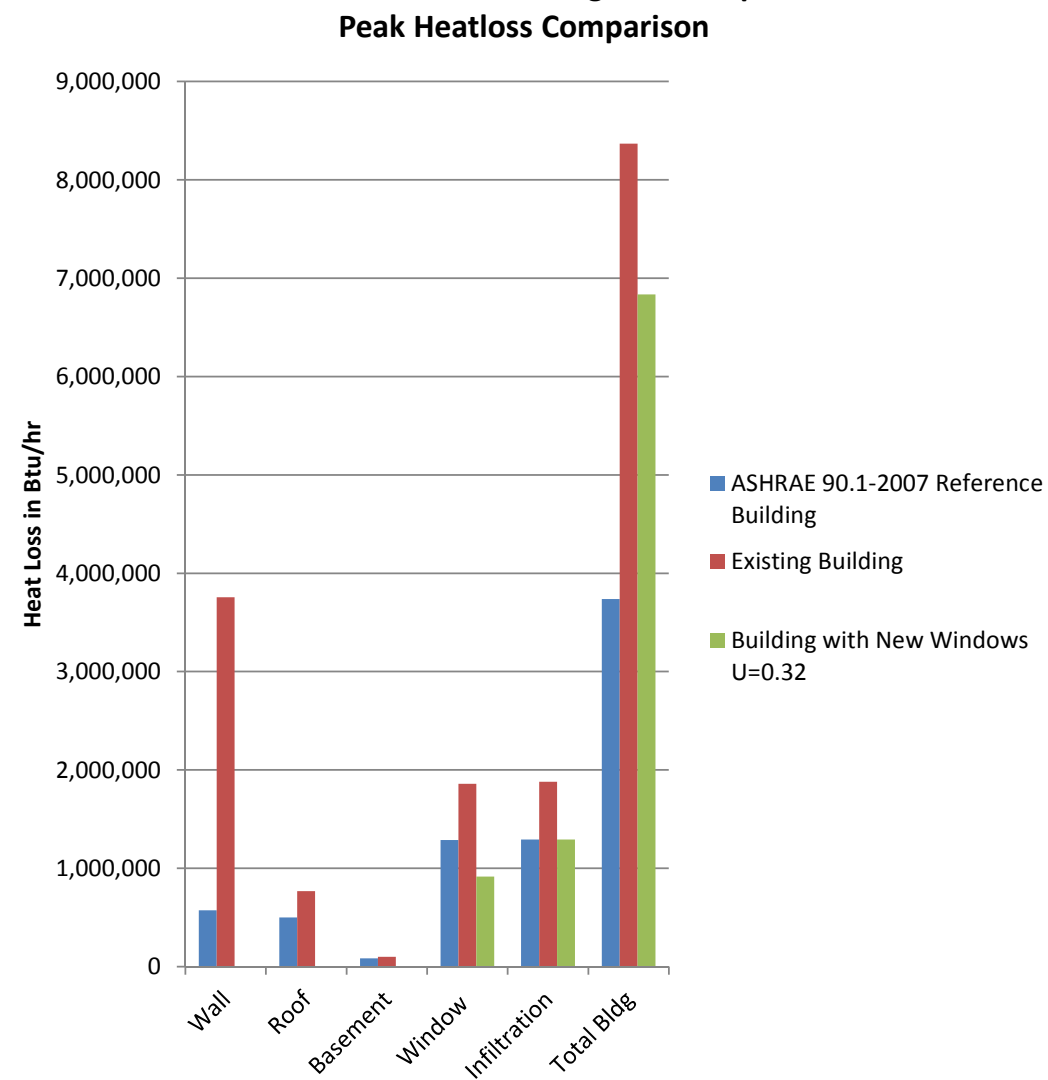
- Lights: 14 W/m²
- AV: 1.5 kW
- People: 71.7 W per person (sensible)
45.4 W per person (latent)

.7 Communication Rooms and Electrical Rooms

- Specific heat gains defined by Electrical Consultant.

.8 Heating/Cooling Load Calculation - Summary

A summary of peak heating and cooling load estimates considering both clear and upgraded glazing was completed and can be provided.



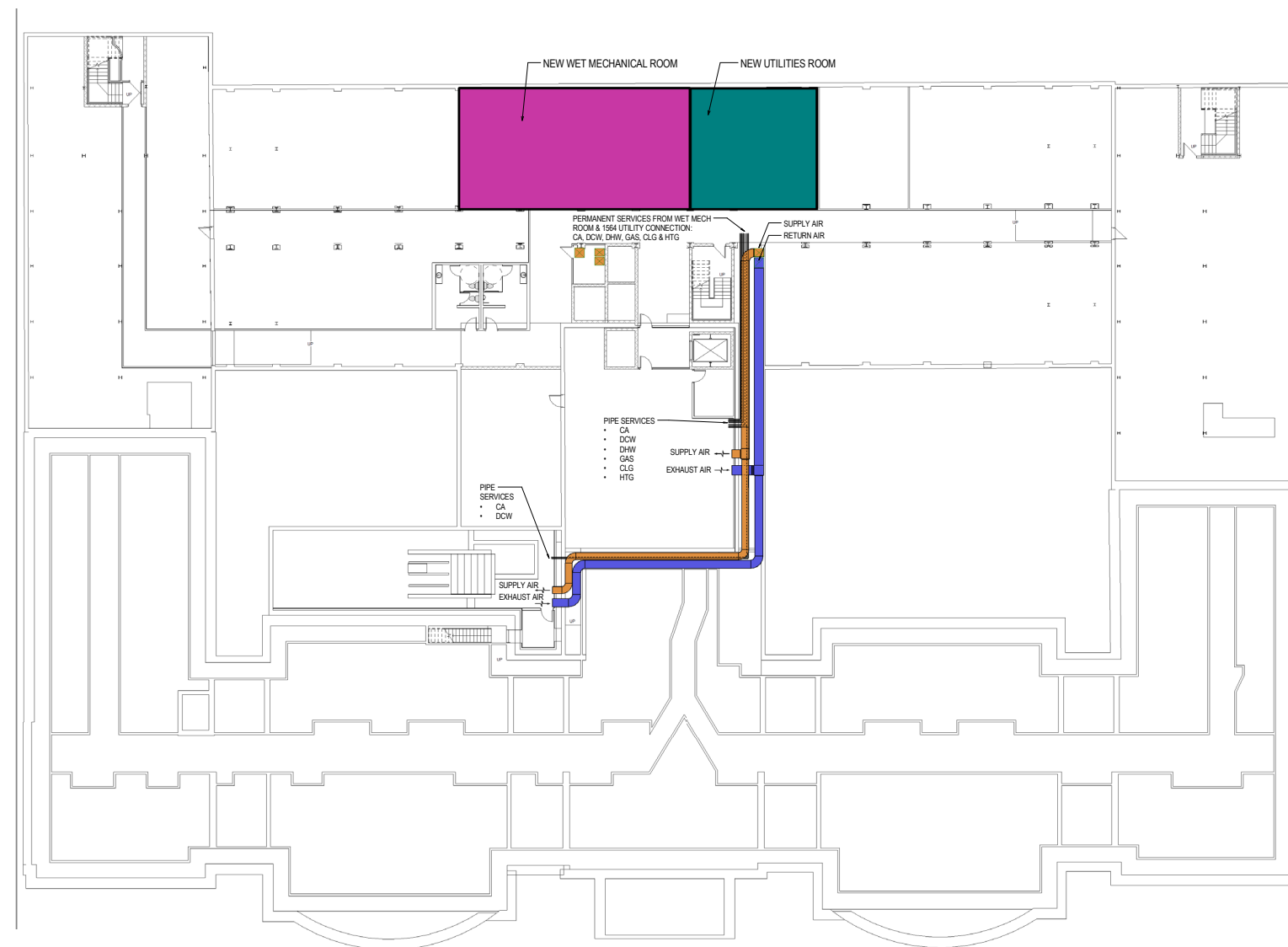
8.3 SITE UTILITY REQUIREMENTS

.1 Steam Supply

A 200 mm high pressure steam service currently enters the building from the utility tunnel into the existing north wet mechanical room located in the basement.

The existing steam utility service will have adequate capacity to service the Dentistry Pharmacy Redevelopment project.

A new wet mechanical room will be constructed adjacent to the existing room. The steam and condensate piping will be offset into the new wet mechanical room, which will accommodate pressure reducing valve assemblies and condensate receiver tank and pump. The existing wet mechanical room will be repurposed into a new secure utility room as an extension of the existing utility tunnel.



Basement Level Plan

.2 Chilled Water Supply

A 250 mm chilled water supply and return main currently enters the building from the utility tunnel into the existing north wet mechanical room.

The existing chilled water utility service will have adequate capacity to service the Dentistry Pharmacy Redevelopment project.

Chilled water piping will be offset from the existing mains into the new adjacent wet mechanical room. Primary chilled water pumps and centrifugal filter/separators will generate chilled water for distribution to secondary systems.

.3 Domestic Water Supply

A 200 mm combined domestic water/fire water supply pipe enters the building from the utility tunnel into the existing north wet mechanical room. The existing utility supply will have adequate capacity to accommodate the new Dent Pharmacy Redevelopment Project. The existing 200 mm combined water line must remain operational through all construction phases as it serves the existing fire hydrant on the south side of the building.

The water service will be offset into the new adjacent wet mechanical room, which will incorporate a pressure booster pump and fire booster pump.

.4 Sanitary and Storm Sewer

Existing sanitary and storm sewer mains below the slab within and leaving the building will be reviewed with a piping camera to document installation quality and demonstrate that the mains are free of debris or blockages, and are properly graded.

Existing tunnels below the 1922 building will be utilized for new sanitary and storm water piping.

.5 Support Services

New natural gas will be supplied to two new emergency generators west of the building.

Existing utility supplied natural gas and compressed air will be extended from the north wet utilities room to service laboratory facilities associated with the SLOWPOKE Reactor spaces.

8.4 SLOWPOKE REACTOR SYSTEMS

Refer to the SLOWPOKE Report - Appendix D.

8.5 VENTILATION SYSTEMS

.1 Design Criteria

- Minimum outdoor ventilation rates prescribed in ASHRAE 62.1-2010 will be met or exceeded.
- Minimum ventilation rates in occupied spaces will be designed for 4 air changes/hr.
- Toilet exhaust will be designed for 10 L/s•m² (2 cfm per square foot).
- Atrium smoke exhaust will be designed for 4 air changes/hr.

.2 Air System Comparison

Heating, ventilation and cooling systems are integrated and the choice of ventilation systems is impacted by several variables, such as:

- Capital cost.
- Utility operating cost.
- Maintenance operating cost.
- Flexibility for change.
- Flexibility for multiple temperature control zones.
- Acoustic performance.

These variables were assessed in a qualitative assessment matrix.

System	Order of Magnitude (% of relative costs)	Relative Operating Cost	System Complexity	Maintainability	HVAC System Reconfiguration Flexibility	Indoor Air Quality	Thermal Comfort	Acoustics	Physical Plant Size	Estimate of Ceiling Space Required, Ft
Dual Duct VAV with perimeter radiant panel	100%	100%	Most Complex	Normal; centralized equipment	Substantial	Excellent -systems provide 100% O/A during free cooling	Excellent; very good zoning control	Good. Attention to HVAC system noise required	100%	4 to 5
Single Duct VAV with perimeter radiant panel	80%	85%	Normal	Normal; centralized equipment	Normal	Excellent -systems provide full 100% O/A during free cooling	Excellent; very good zoning control	Good. Attention to HVAC system noise required	75%	3 to 4
4-Pipe Fan Coil, 100% ODA Ventilation Unit	85%	75%	Normal	Substantial; distributed maintenance	Substantial	Acceptable - minimum outdoor air for Ventilation	Fair-overhead delivery of warm/cool air; limited zoning	Concern with location of fan coil units; radiated cabinet noise is problematic	50%	4
Chilled beams; 100% O/A Ventilation supply; perimeter radiant panel	66%	60%	Simple	Normal; some distributed maintenance	Normal	Acceptable- minimum O/A for ventilation	Very good; good zoning control; need to consider humidity	Good. Attention to HVAC system noise required	50%	2 to 3

Mechanical Systems Comparative Matrix

The recommended system is a decoupled ventilation system that will supply primary 100% outside air at a minimum of four (4) air changes and is temperature independent of occupied spaces.

In this regard, we recommend that a tempered air supply system with medium pressure distribution be utilized, interfaced with a system of wet perimeter ceiling mounted radiant heating/cooling panels and ceiling mounted induction style “cold beams” to offset building envelope and internal heat gains.

It was established that the air system capacity will be designed to deliver 94,400 L/s (200,000 cfm) during maximum operating capacity.

Several iterations of physical size and locations for air handling units were considered, including:

- Multiple compartmental style air handling units, located two (2) per floor in the northwest and northeast corners at 9,400 L/s (20,000 cfm) each.
- Centralizing two (2) air handling unit per floor at 9,400 L/s (20,000 cfm) each.
- Consolidating onto the 7th Floor to accommodate multiple air handling units; five (5) units at 18,900 L/s (40,000 cfm) each.
- Reducing the number of air handling units to two (2) on the 7th Floor.

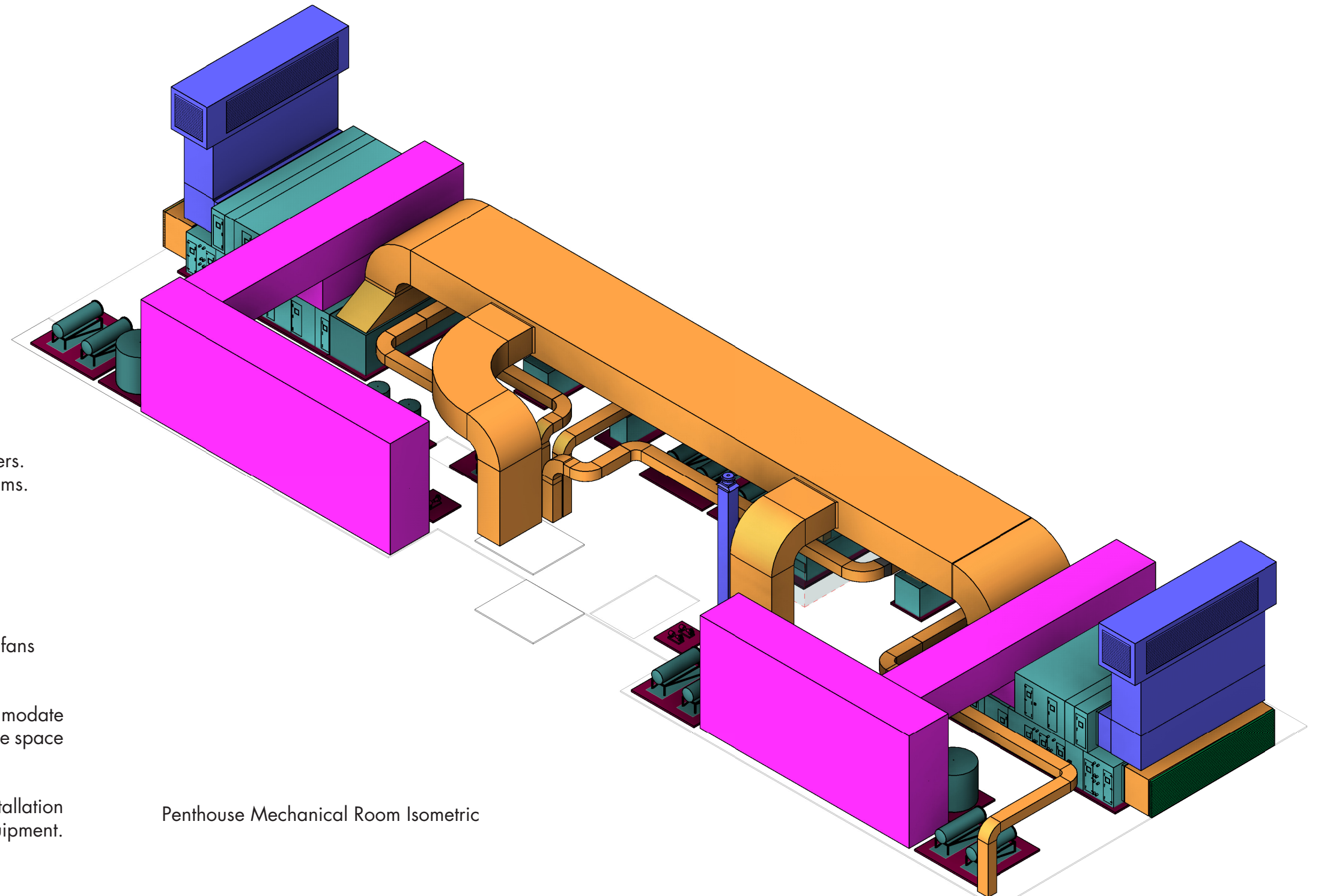
Expanding the 7th floor to provide new mechanical rooms east and west of the existing 7th Floor Mechanical Room was a best fit for program space constructability, phasing, and operations and maintenance.

Accordingly, two (2) major air systems will be utilized within the 7th floor penthouse, each at 47,200 L/s (100,000 cfm). The air systems will incorporate the following components:

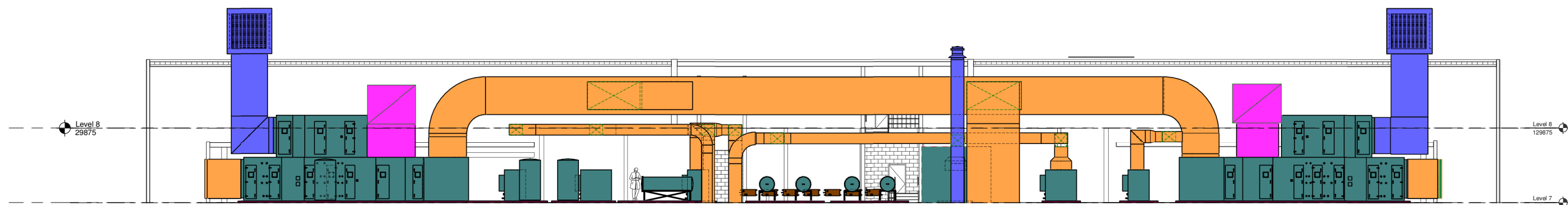
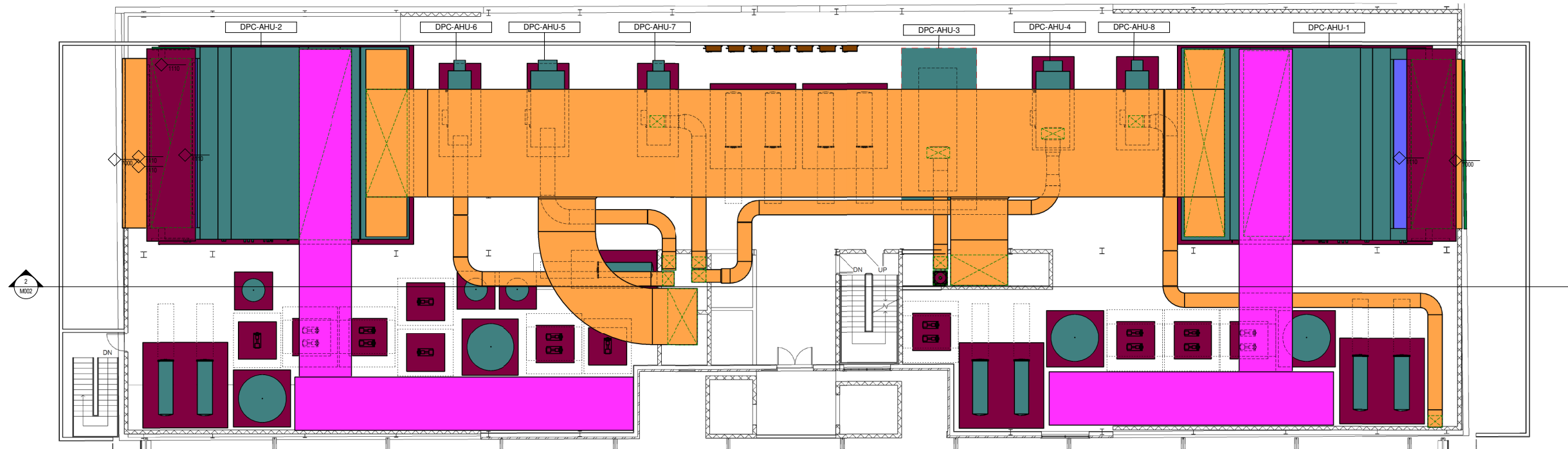
- Intake and exhaust louvres with motorized dampers.
- Silenced intake, exhaust, supply and return plenums.
- MERV14 filtration (90% efficient).
- Glycol preheat coil.
- Heat recovery enthalpy wheel.
- Cooling coil.
- Tempering/reheat coil.
- Steam grid humidification.
- "Fan Array" style (multiple) for supply and return fans with variable frequency drives.

Structural integrity was confirmed acceptable to accommodate the weight of the air systems within the 7th floor penthouse space in the north building.

New walls and roof will be constructed to allow for the installation of the air handling units and will house the air handling equipment.



Penthouse Mechanical Room Isometric



Penthouse Mechanical Room Plan and Elevation

3.8 Mechanical Systems

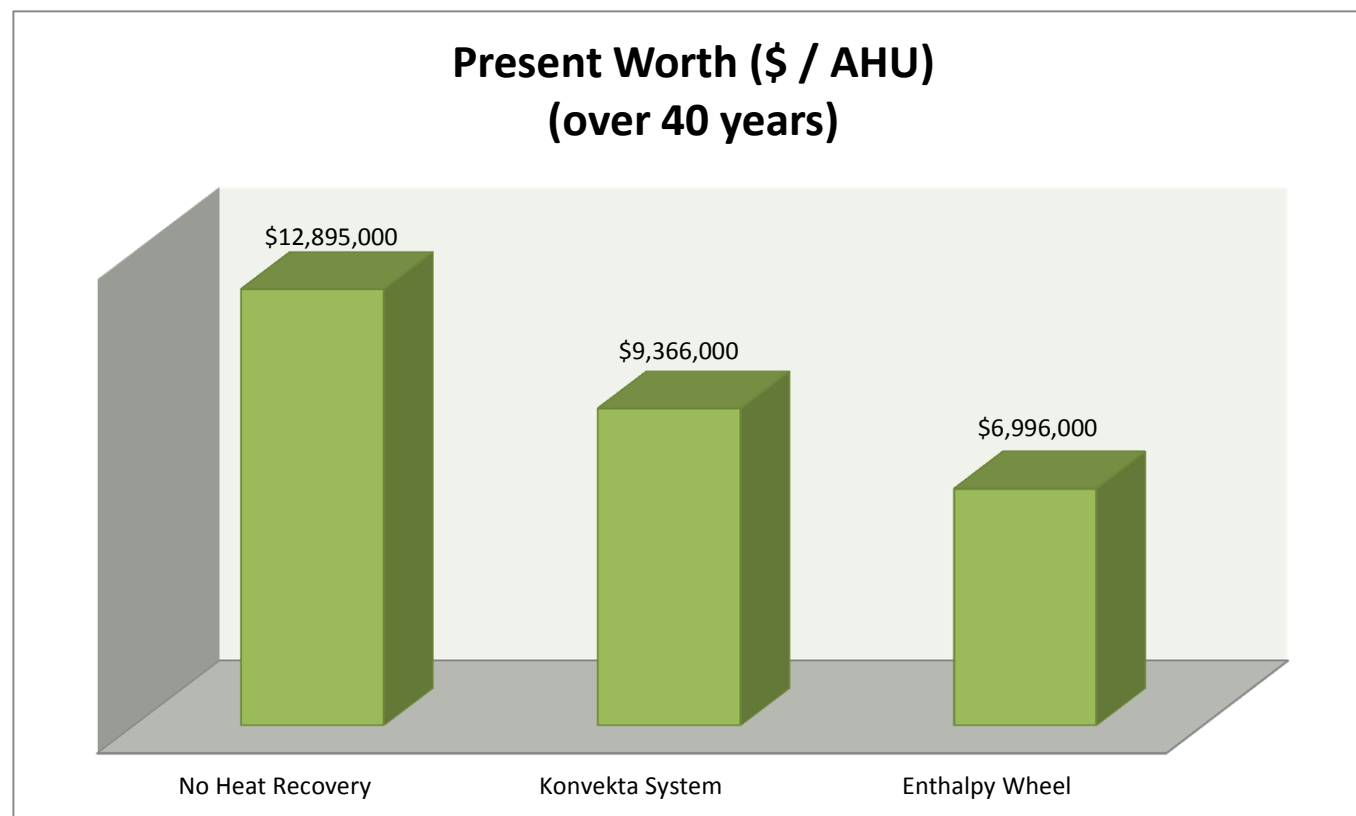
.3 Heat Recovery

Two alternate heat recovery systems were subject to life cycle cost analysis. The two systems studied were:

- Heat recovery using enthalpy wheels.
- Heat recovery using "Konvekta" packaged "run around" style coils and pumping.

Life cycle costs were estimated over a 40 year life of the building and brought to "Present Worth".

The analysis shows that heat wheels have a better life cycle performance than the "Konvekta" recovery system (detailed study calculations can be provided). Present Worth results for one 47,200 L/S (100,000 cfm) air system are summarized as follows (please note there are two (2) air systems AHU-1 & AHU-2):



AHU Present Worth Chart

.4 Primary Air Distribution

Insulated medium pressure supply ducts with maximum 500 mm (20") height will develop a loop main around each floor. The duct mains will be strategically located near the centre of the occupied floor space to avoid conflict with main piping system distribution and cable trays.

Single duct, variable volume, digital controlled air terminal units will be utilized to deliver primary outside air to occupied spaces. Terminal units will each be fitted with hot water tempering coils and discharge silencers. Terminal units will be controlled by "Application Specific Controllers", incorporating inputs from space temperatures, occupancy sensors, and carbon dioxide monitors to regulate the volume of air delivered to the space.

.5 Secondary Air Distribution

Supply air from individual terminal units will be ducted to "cold beam" terminals and supply grilles or diffusers in low velocity un-insulated ductwork.

.6 Return Air Distribution

Transfer grilles in the ceiling will allow air from occupied spaces to migrate into the ceiling plenum, and air will be routed to the Atrium space.

Return air louvres/grilles at the top of the Atrium will be utilized to route the return air directly to fans in the air handling units in the 7th floor penthouse.

Using the Atrium as a return plenum will provide several benefits:

- Less fan energy is utilized compared to ducted return systems.
- In winter months, solar gain through clearstorey glazing will warm the return air, thereby enhancing heat recovery efficiencies.
- Air supply requirements to cool the Atrium space are minimized due to the high air change rate provided by the return air.

.7 Atrium Ventilation

Air will be supplied to the Atrium by linear sidewall diffusers. Air volume delivery will be designed at 10 L/s per person (20 cfm per person) to accommodate the programmed maximum occupancy.

In accordance with Alberta Building code requirements, the Atrium will be exhausted at a rate of 4 air changes per hour. The definition of volume relating to Atrium space will be a function of doorways that isolate the Atrium in conjunction with access corridors.

.8 Toilet Exhaust Ventilation

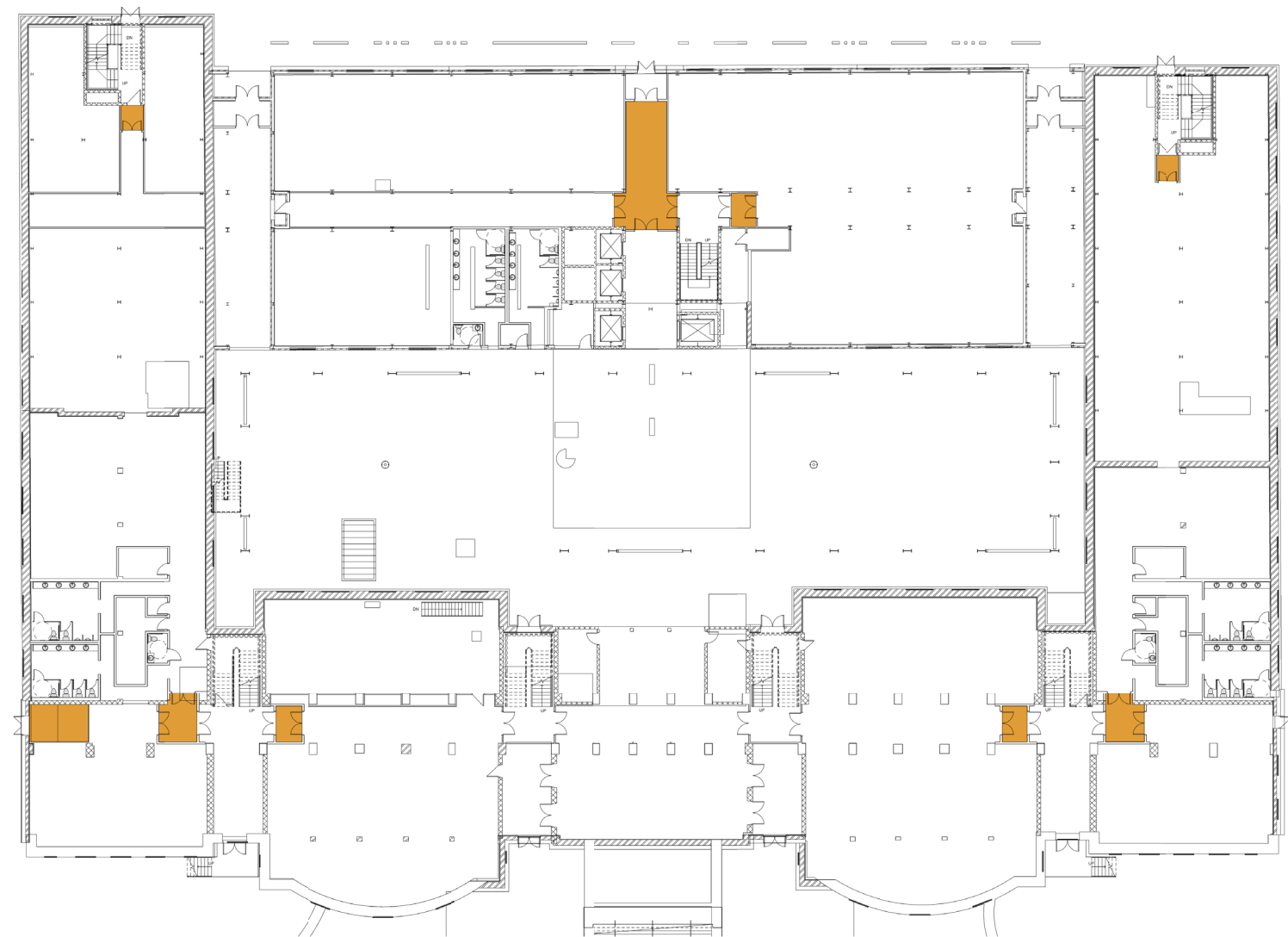
Washroom spaces and janitor rooms will be exhausted at 10 L/s•m² (2 cfm per square foot). A dedicated exhaust fan and duct system will direct toilet exhaust to the heat recovery inlets in the air handling unit exhaust section before the exhaust air is directed to atmosphere.

.9 Vestibule Pressurization

100% tempered outside air must be delivered to pressurize stairwell vestibules in compliance with the Alberta Building Code.

Air supply must be secure for 1 hour fire rated delivery. Options to accommodate this provision include:

- Dedicated air supply units, approximately 1,900-2,360 L/s (4,000-5,000 cfm) each, to deliver tempered outside air into the vestibules associated with each emergency egress stair interconnecting with the Atrium.
- Utilize the central system supply fans to deliver 100% tempered outside air into vestibules associated with each emergency egress stair. Duct distribution must be enclosed in a 1 hour fire rated furring or duct wrap.



Pressurization Zones Level 1

8.6 HEATING SYSTEMS

.1 Central Plant Conversions

High pressure steam at 1034 kPa (150 psi) will immediately be reduced to low pressure steam at 82.7 kPa (12 psi) upon entry into the new wet mechanical room. Pressure relief valves will be set at 103.4 kPa (15 psi). The pressure reducing valve assembly will consist of the following single stage valves in parallel:

- Two (2) control valves, each at 2/3 of maximum design flow.
- One control valve at 1/3 of maximum design flow.
- One pilot operated self-contained valve at 100% of maximum design flow.
- Pressure relief valve(s) on low pressure side discharge piped to atmosphere.
- High pressure drip assembly with discharge from trap through a flash leg and interfaced with the low pressure steam header.

A condensate tank and transfer pump assembly will collect low pressure condensate and connect to the pumped condensate main in the utility tunnel.

All steam piping (high pressure and low pressure), valves and fittings will be insulated.

.2 Heat Exchange Systems

Low pressure steam will be piped to the following heat exchange systems:

- Duplex heat exchangers to generate hot water for building heating systems:
 - perimeter radiation
 - terminal unit reheat coils
 - entrance heating units
 - in-slab Atrium heating
- Duplex heat exchangers to generate hot glycol for distribution to heating coils in air handling units and heating coils in vestibule pressurization units.
- Double wall, duplex heat exchangers using building heating hot water to generate domestic hot water.

.3 Pumping Systems

Where duplex pumping is shown on schematic drawings, each pump will be 100% duty/standby. Each pump will utilize independent VFDs and full size impellers to optimize pumping efficiencies.

.4 Heating Distribution Systems

Secondary pumping from steam to hot water systems will utilize insulated reverse return piping distribution, looped on each floor for perimeter heat, Atrium in-slab heat, entrance heat, and terminal unit heating coils.

Secondary piping from steam to glycol heat exchangers will utilize insulated, reverse return piping to preheat coil sections in the air handling units.

Secondary piping from the same heat exchangers will service heating coils in air pressurization units serving the vestibule pressurization systems.

.5 Atrium Heating

PVC tubing with an oxygen barrier will be cast into the Atrium floor (excluding the slowpoke vault roof and central wing slab) to provide heating for the space. Each zone will include a three-way control valve and secondary pump with header connections to the PVC pipe. In-floor heating manifolds will be housed in cabinets located in adjacent spaces.

Upper levels will incorporate finned tube elements in cabinets to offset heat loss from clearstory glazing.

.6 Perimeter Heat

The building perimeter will utilize ceiling mounted, radiant heating panels (600 mm wide) continuously along the perimeter.

.7 Entrance Heat

Fan coils will be used for entrance vestibule heating, with ducted supplies to direct air flow to effectively blanket the entrance.

.8 Attic Heat

Bare fin radiation elements will be utilized to provide heat into attic spaces. The attic spaces must be kept above freezing to accommodate wet sprinkler system distribution.

8.7 COOLING SYSTEMS

Upon entry into the building, utility chilled water will be cleaned using centrifugal separators and primary chilled water pumps will boost pressure for delivery into the piping distribution.

Primary chilled water will be directed to cooling coils in air handling units.

Chilled water will be circulated through a heat exchanger to interface with the radiant panel distribution and circulate "high temperature chilled water" to perimeter radiant panels and Atrium in-slab piping during summer months.

A second heat exchanger will be used to circulate "high temperature chilled water" year round to cold beams in occupied spaces.

During winter months, the cooling coils in the air systems will be utilized to generate chilled water, thereby avoiding use of utility chilled water and improving the heat efficiency of the air handling systems. This system can be used for cooling server rooms, electrical rooms, and communication rooms.

Office zones will utilize cold beams for cooling internal and perimeter heat gains.

Council chambers and Atrium spaces will utilize cool air supply to cool the occupants and maintain comfortable conditions.

Communication rooms and electrical rooms will utilize chilled water fan coils to maintain temperatures. If fan coil units are not able to generate the required cooling capacity, heat pump units will be used.

8.8 PLUMBING SYSTEMS

An existing 200 mm combined domestic/fire water service that enters the building into the existing wet mechanical room will be offset into the new wet mechanical room. The service will be split into a domestic service with reduced pressure backflow preventer assembly and a fire water service with double check backflow preventer assembly.

Both the fire water and domestic water service will be pressure boosted for delivery and distribution to the building.

The domestic water pressure booster will utilize variable frequency drives in a packaged assembly. Pressure boost will be designed to avoid pressure reducing valves on lower levels.

Domestic hot water at 25°C will be generated in a double wall heat exchanger using building heating hot water as a heating media. Small capacity storage or "buffer" blending tanks will be utilized to achieve a uniform, blended temperature before distribution to fixtures.

Tepid domestic warm water will be the only water delivered to all hand wash sinks with recirculating piping; domestic cold water will not be extended to the sinks. Infra-red faucet will be provided for all hand wash sinks.

A 150 mm domestic water express main will be extended to the upper penthouse.

Domestic cold water will be extended from the penthouse to urinals and water closets. Low volume infra-red sensing flush valves will be used on urinals; hand operated low volume flush valves will be used on water closets.

Domestic cold water will also be distributed to bottle fill stations.

Non-freeze hose bibs will be strategically located along the building perimeter.

8.9 FIRE PROTECTION SYSTEMS

The incoming water service will be pressure boosted in an approved assembly. Piping distribution will be extended to the sprinkler zones throughout the building:

- Floors 2 - 4 (two zones per floor).
- Atrium will be separately zoned.
- Attic spaces will be separated zoned.

The main electrical room will be constructed to meet fire ratings that will not require this space to be sprinklered.

Sprinkler systems will be hydraulically calculated to NFPA 13.

Pendant sprinkler heads will be installed as Tenant Improvement Fit-Outs are completed.

Investigation will be carried out with the Code Authority to determine if sidewall sprinkling for the Atrium would represent a more secure system than distribution from the top of the Atrium. Sidewall sprinkling is a departure from NFPA13, which would require heads to be located at the top of the Atrium.

Fire valves in cabinets for hose connections will be located as required by the Alberta Building Code and in accordance with provisions in NFPA 14.

Hand-held extinguishers will be provided in cabinets to comply with NFPA 10 (23 m in travel distance between extinguishers).

Service spaces, such as mechanical rooms, janitor rooms, electrical rooms (except main electrical room), communication rooms and attic spaces will be serviced with exposed, upright heads.

A new hydrant and fire department connection will be provided at the south entrance to the building. The existing fire department connections at the north entrance will be removed.

8.10 CONTROLS

The controls system will be capable of "standalone" operation and will communicate with the University's existing RCMS network.

BAS communication systems will be BACnet/IP at the Master controller level and BACnet MS/TP at the terminal control level.

Major components of the Building Automation System will include:

- A network of Distributed Control Panels.
- Instrumentation required for control sequences and monitoring.
- Application software.
- Hard wired interconnections and interlocks on equipment and system interfaces.
- Space temperature sensors, controllers, CO2 sensors, control valves, damper motor operators components, and installation for space temperature control.
- Interface with electrical lighting system relating to occupancy sensors and space temperature and volume setbacks during unoccupied periods.

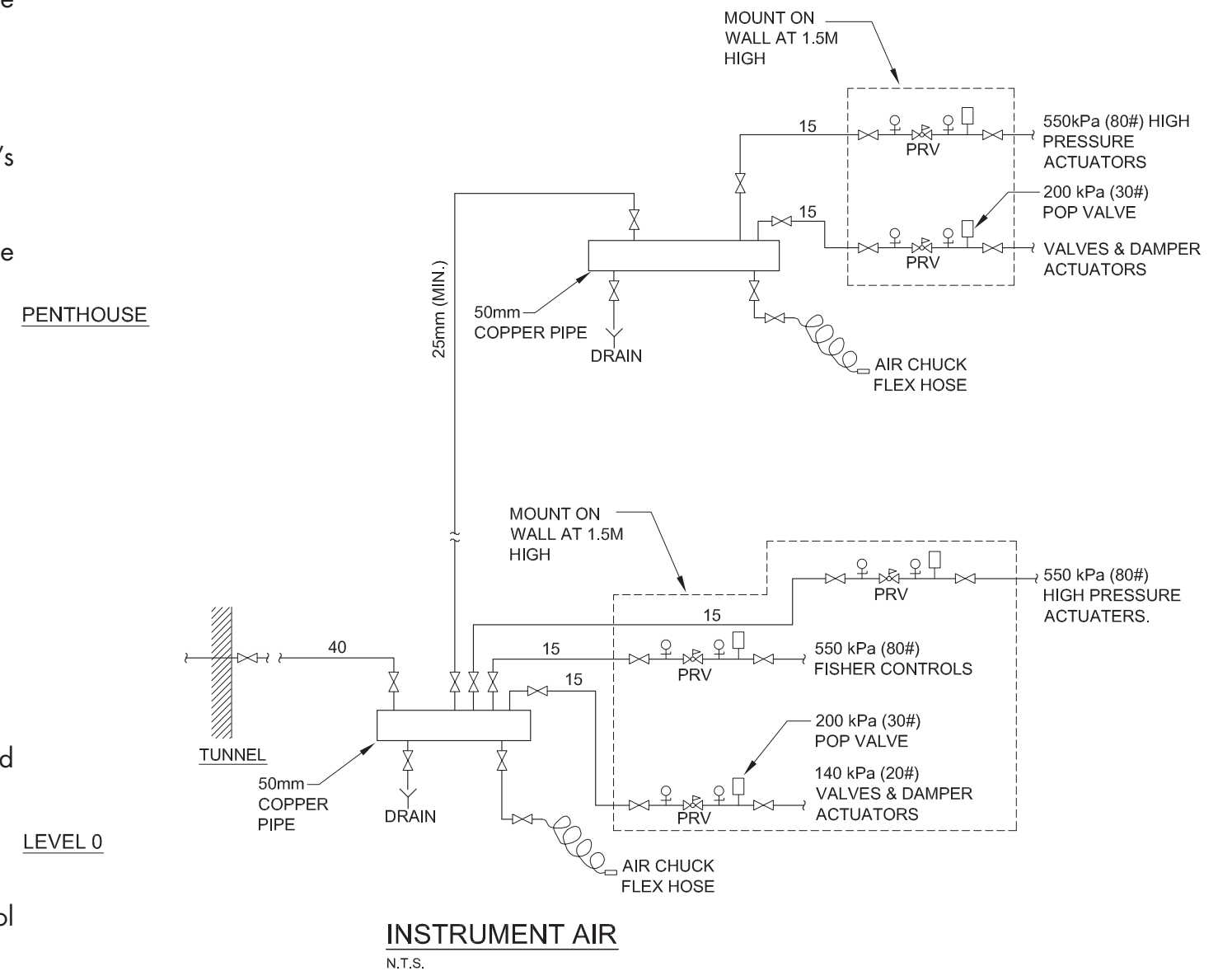
BAS Building Architecture:

- BAS Automation Level will include the DDC controllers that interface with field sensors and control components including Distributed Control Panels and Terminal Controllers (Application Specific Controllers with pre-packaged operating sequences).

: Field Level will include instrumentation interfaced to the BAS Automation Level DDC controllers, such as temperature, humidity, level sensors, pressure sensors and switches, valve and damper actuators, and control relays.

: Field panels to be BACnet BTL certified.

Instrument air controls will be provided to service large valve and damper actuators.



Instrument Air

8.11 SUSTAINABLE DESIGN INITIATIVES

The following energy saving initiatives will be incorporated into the mechanical design:

- Decoupled ventilation air; separate space temperature control by hydronic control, thereby lowering net power use.
- Utilize internal heat gains to preheat ventilation air and generate chilled water for cooling internal heat gains during winter months.
- Utilize heat content in building exhaust air flows to preheat outside air through heat recovery methods.
- Utilize changeover cooling to perimeter radiant panels and in-slab systems to reduce fan power usage.
- Utilize CO2 detectors and occupancy sensors to reduce ventilation air supplies and setback space temperature control during unoccupied periods.
- Utilize variable frequency drives on fans and pumps to reduce motor power consumption to meet load demand.
- Utilize low volume plumbing fixtures.
- Design duct distribution systems for low pressure drop.
- Utilize multiple variable frequency “fan array” systems in air handling systems with direct drive fan assemblies.
- Utilize effective insulation thickness (consistent with ASHRAE and NEC) on hot and cold piping systems and primary duct distribution systems.
- Utilize high efficiency motors.

8.12 MECHANICAL APPENDICES

The following Mechanical Drawings are in Appendix M1:

- .1 Steam/Hot Water System Schematic (1)
- .2 Steam/Hot Water System Schematic (2)
- .3 Chilled Water System Schematic
- .4 Building Ventilation Schematic
- .5 Vestibule Pressurization Schematic
- .6 Level 1 – Ventilation Distribution
- .7 Level 2 – Ventilation Distribution
- .8 Level 3 – Ventilation Distribution
- .9 Level 4 – Ventilation Distribution
- .10 Level 5 – Ventilation Distribution
- .11 Level 6 – Ventilation Distribution

Refer to Appendix M2 to find the Preliminary Mechanical Equipment List

Refer to Appendix M3 to find the Mechanical Specification Outline

9.1 INTRODUCTION

A basic outline of the perceived strategies for power distribution, low-tension systems, communication systems, and fire alarm & life safety systems for the proposed Dentistry Pharmacy Building Redevelopment have been included to summarize discussions and concepts developed to date for base building core and shell.

The electrical services proposed for the Dentistry Pharmacy Building Redevelopment are based upon an anticipated gross building area of approximately 32,948 m².

The final electrical design will be based on the following University of Alberta, Code(s) and applicable Standards including:

- University of Alberta, Facilities Management Commissioning Manual
- University of Alberta, Electrical Design Guidelines
- University of Alberta, Fire Alarm Design Standards, draft copy issued January 2005
- University of Alberta, Electric Utility Standards, draft issued December 2004
- ANSI, IEEE, EEMAC Standard for High and Low Voltage Switchgear
- C22.1-12, 2012 Canadian Electrical Code – Part I
- Regulations of the Alberta Electrical Protection Branch – Safety Codes Act
- 2006 Alberta Building Code
- CSA Standard B651-95 Barrier Free Design
- Latest CAN/ULC Fire Alarm Standards
- CSA B44-09 Elevator Code
- CSA C282.09 Emergency electrical power supply for building
- CSA CAN/CSA-B72-M87 (R2003) Lightning Protection Standards
- Latest Illuminating Engineering Society of North America (IESNA) Standards
- AICT Guidelines

9.2 CODE ANALYSIS REVIEW

In review of the updated Building Code Analysis the following items require to be addressed within the electrical scope of work:

- All exit doors with magnetic holds shall release under Fire Alarm Stage 1 condition.
- Provide new fire-stopping at all floor and fire rated penetrations.
- All light diffusers shall be rated FS (flame spread) between 250-600. This item is more noted for future lighting fit ups.
- Fire alarm zoning shall coordinate with the sprinkler zones and all required fire separations. No zone shall be greater than 5,000 m².
- Fire alarm system shall include a voice communication system to meet University of Alberta standards.
- Emergency lighting shall be provided to not less than an average of 10 lux at the floor.
- Emergency power supply shall operate full load for minimum 2 hrs. including fire pumps and all elevators (one at a time).

9.3 LIFE CYCLE ANALYSIS

Within the current core and shell design the life cycle analysis includes the main core and shell distribution system.

The base building distribution system including the proposed switchgear, feeders, and transformers are anticipated to last between 25-30yrs with proper routine testing, maintenance, and the availability of parts.

Future life cycle cost analysis shall be provided at a later date for lighting design options comparing LED to conventional lamp source and low voltage lighting control systems.

9.4 SUSTAINABILITY

The electrical design will focus on providing occupant comfort and energy efficient design using the following techniques:

- Occupancy sensors will be provided throughout the building with direct connection into the BMS system.
- Daylight sensors will be provided for perimeter spaces complete with local on/off control.
- Lighting power densities will be considered to be <30% of ASHRAE 90.1 2004 standards.

9.5 DEMOLITION

A complete demolition of every floor shall be completed to accommodate a new core & shell space intended for future fit up. Careful coordination is required to stage system shut downs to accommodate the demolition. All existing electrical distribution and switchgear shall be removed. To date the University of Alberta has not indicated if any existing equipment shall be turned over for maintenance spare parts.

9.6 POWER DISTRIBUTION

.1 Power Distribution System Design

System planning for an electrical distribution system requires a close and clear examination of the critical needs and objectives of a facility. In making recommendations and then settling on a final design, the following factors have been taken into consideration:

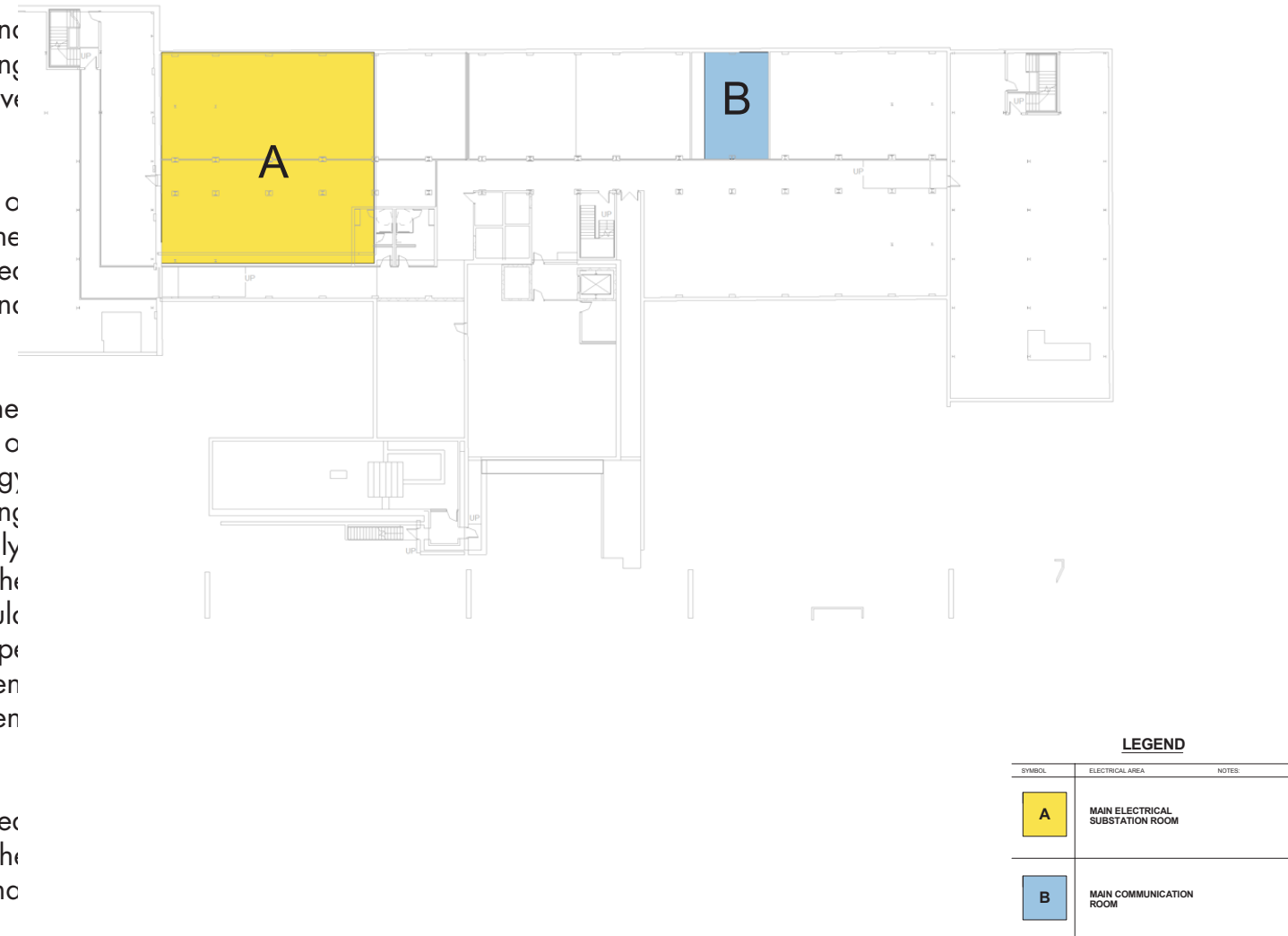
Safety: There should not be any compromise on this issue. The choice of equipment used will result in optimization of the operational safety for personnel and the performance of the electrical system. For instance, equipment fully rated for the available fault current at that point of the power distribution system and operational safety will be employed.

Reliability: The level of continuity of service required varies with customer needs. The higher the level of continuity required the greater the level of redundancy that must be built into the electrical system. A system topology where more than one route of continuity is available by means of switching tiebreakers or switches greatly increases the reliability of the system. Typically two or more primary feeders to a facility are incorporated whenever the continuity of service becomes paramount. Ideally, each of these feeders would originate from a separate utility substation. One of the requirements of this type of an arrangement is the need for fully rated equipment. Fully rated equipment will be able to withstand the maximum load current values that may be present on the system under a worst-case condition.

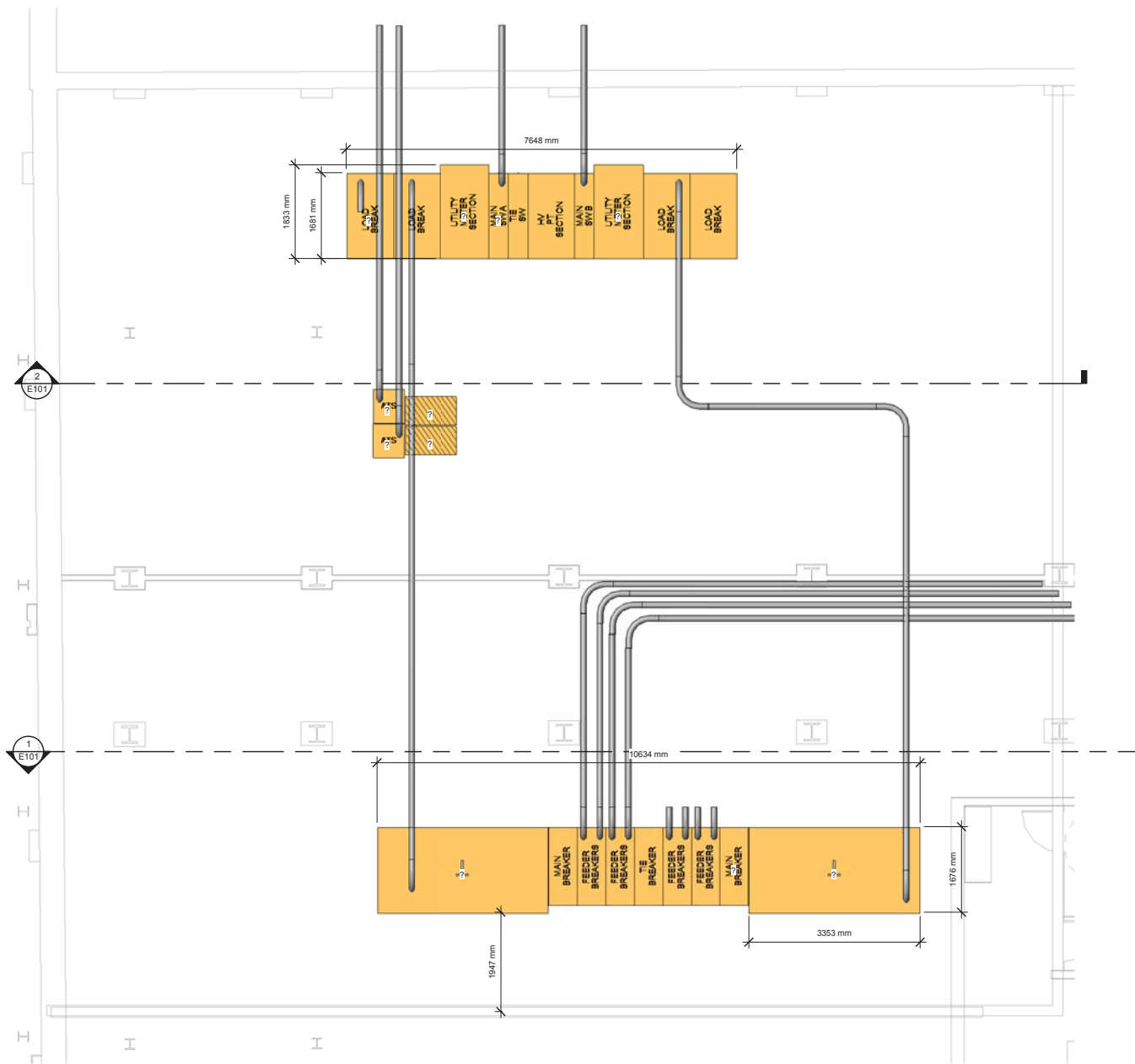
Simplicity of Operation: The level of safety and reliability is directly associated with the degree of simplicity of the system. Unnecessary complications in the configuration of the system may leave confusion in the minds of operations personnel.

Maintenance: The electrical system should lend itself to being fully serviceable and repairable with the least amount of disruption to the operations of the facility. This requires that the equipment be accessible and available for inspection and repair. Ideally the equipment should be easily available from a local supplier in the event that replacement is required.

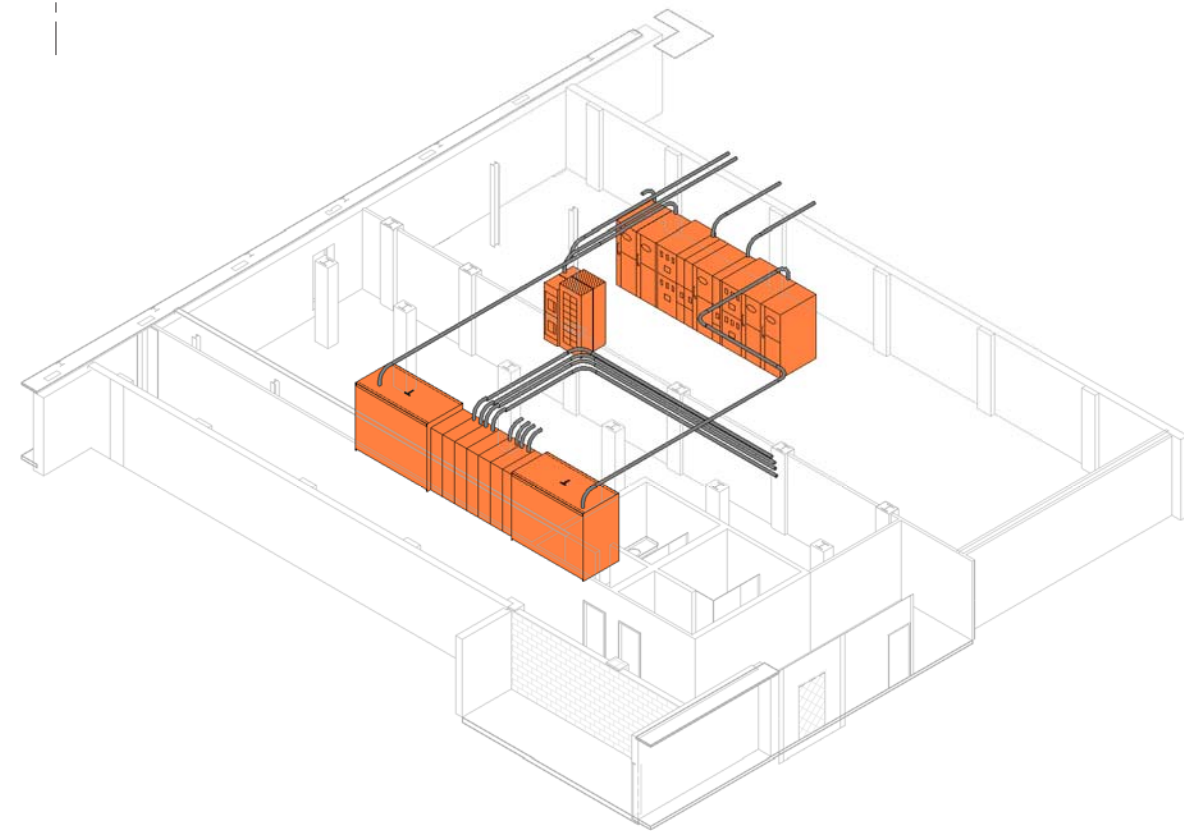
Flexibility: The configuration of the electrical system should allow for future needs and additions. The allowance for increasing load demands and the meeting of these requirements without adversely affecting the present system reflects the resilience of the initial profile.



Basement Electrical Room Key Plan



Basement Main Electrical Room



HV Substation ISO

.2 Power Distribution - Summary

The total connected load for the Dentistry Pharmacy Building is estimated at 2,337 kW based on a building size of 32,948m² determined by input from the University of Alberta Electrical Utilities. One 13.8 kV double-ended substation will be provided adjacent to the utility tunnel. Two power transformers will be provided rated at 2500 kVA complete with forced fan cooling. The design provides for a minimum of 25% reserve capacity at the power transformer. The main electrical room will consist of new service entrance utility switchgear combined with 600V switchgear and will be located in the basement along the north wall. This location was deemed to be the most suitable because of the location of incoming feeders from the existing manhole along the north end service road and the ease of access to the electrical equipment for removal and maintenance.

.3 Power Distribution – Approach

While investigating the power distribution philosophy to the building it was determined that the main power feed to the building will be fed from the North Power Plant, directly north of the Dentistry Pharmacy Building. The design approach for this facility is to use a dual primary system on the primary 13.8 kV side with a 600 V secondary selective radial distribution. The key reasons for this configuration are:

- By incorporating two (2) separate primary feeders, system reliability is improved. Each primary feeder has the capability of supplying the entire load. Failure of one system does not jeopardize the entire system; there is no single point of failure.
“Flexibility” “Reliability” “Safety”
- Selective operation of the primary load break switches provides an allowance for repair, replacement, and re-routing of service. If only one primary switch is used, the requirement to service or repair without disruption of the electrical system is not possible.
“Maintenance” “Simplicity of Operation” “Safety”
- Transformers require regular maintenance and inspection. A secondary selective topology will allow for continuity of service while preventative and/or emergency maintenance of a main transformer takes place.

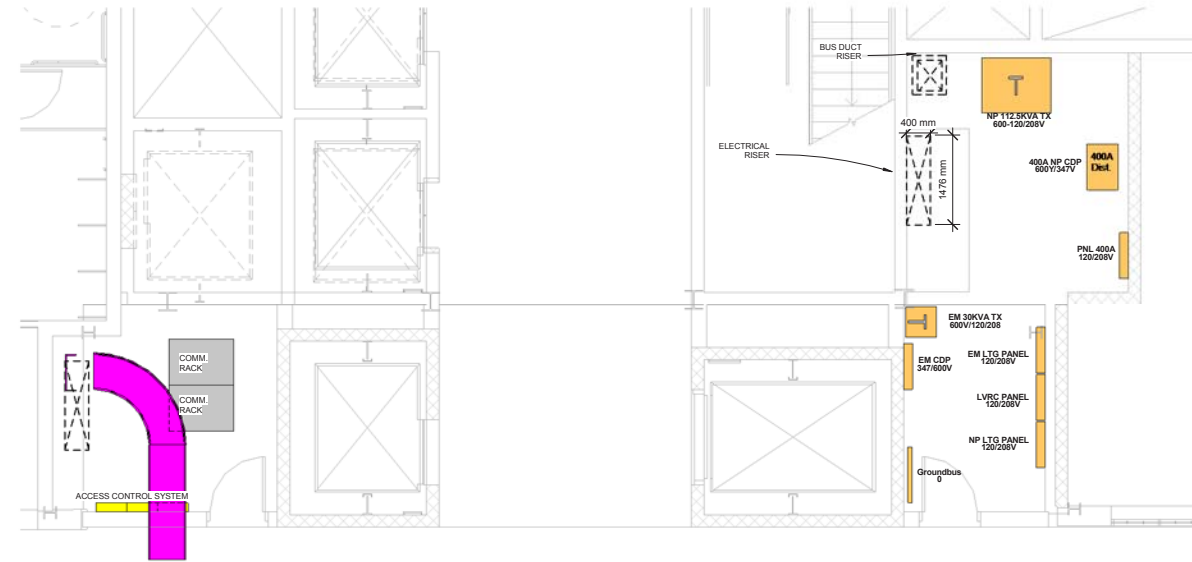
The standard operating, distribution and utilization voltages for the Dentistry Pharmacy Building will be 600 V, 3-phase, 3-wire and 120/208 V, 3-phase, 4-wire. The power distribution system will be complete with a 600V, 3-phase, 3-wire bus duct riser system distributed through three (3) sets of electrical rooms on each floor complete with 600/208/120V step down transformers and associated distribution centers.

“Reliability” “Safety”

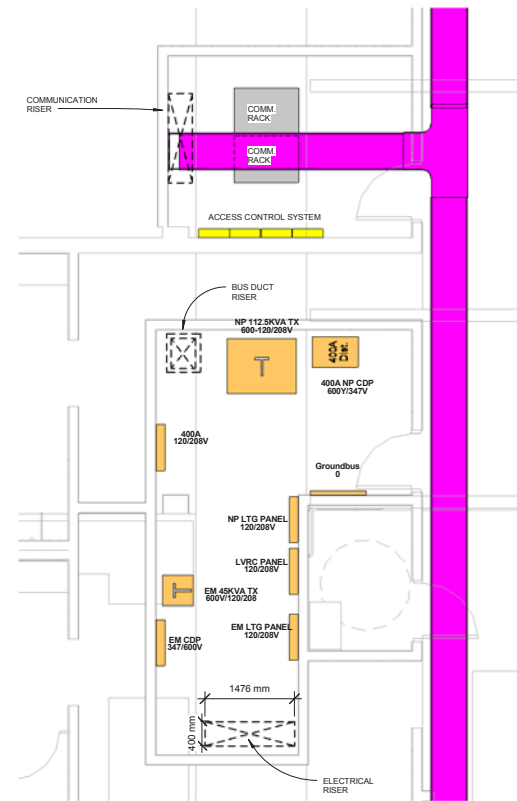
Typical Electrical and Communication Room Key Plan



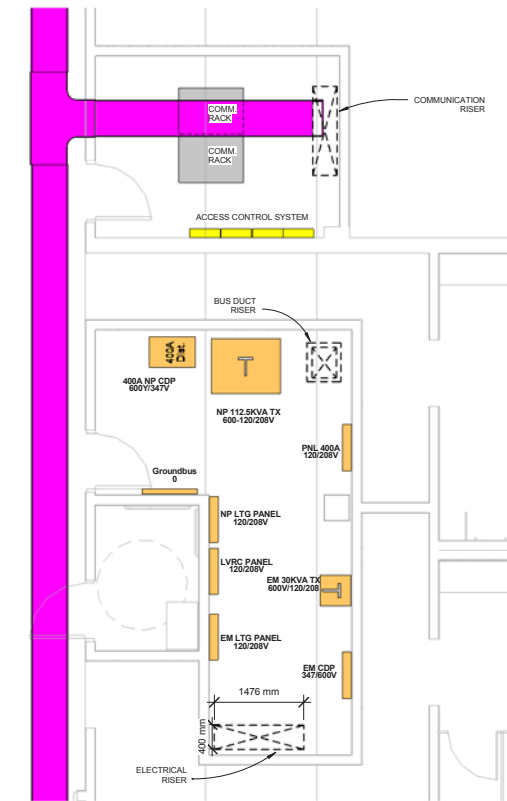
3.9 Electrical Systems



Typical North Wing Electrical and Communication Room



Typical West Wing Electrical and Communication Room



Typical East Wing Electrical and Communication Room

.4 Emergency Power Distribution

Emergency power for the Dentistry Pharmacy Building was assessed at approximately 750kW including mechanical, power, and lighting loads. A new 1000kW natural gas generator will be located south of the loading dock.

Note: Final size of the generator is to be confirmed with the University of Alberta once user requirements are determined.

Two distinct emergency power distribution systems will be provided for essential and non-essential loads within the building.

.5 Power Distribution Estimated load calculations

DENTISTRY PHARMACY ESTIMATED TOTAL ELECTRICAL LOAD CALCULATION				Project Development Report									
				BASIC DESIGN REFERENCE DATA			Calculation Parameter			Connected Load [KVA]	Estimated Demand [%]	Total Est. Demand Load	
				Q'ty	Unit	Reference	Q'ty	Unit	Reference				
E-1	Lighting												
	Interior Lighting	General	Basement			1,762	[M ²]		13	60	8		
			Level 1			4,756			34	60	20		
			Level 2			4,094			29	60	17		
			Level 3		7	[W/M ²]	ASHRAE 90.1-2004 LEED < 30%	3,415		24	60	14	
			Level 4					3,383	[M ²]	24	60	14	
			Level 5					1,589		12	60	7	
			Level 6					1,570		11	60	7	
			Penthouse					1,570	[M ²]	11	60	7	
E-2	Receptacle/Power												
	Receptacle	Office, Processing & Common Area	Basement			1,762	[M ²]		89	60	53		
			Level 1			4,756	[M ²]		238	60	143		
			Level 2			4,094	[M ²]		205	60	123		
			Level 3		50	[W/M ²]	Tab 14 CEC	3,415	[M ²]	171	60	103	
			Level 4					3,383	[M ²]	170	60	102	
			Level 5					1,589	[M ²]	80	60	48	
			Level 6					1,570	[M ²]	79	60	47	
			Penthouse					1,570	[M ²]	79	50	40	
E-3	Elevator												
	Elevator					35	[KVA/Set]	4	[Set]	DESIGN DRAWING	140	80	112
E-SUB	Electrical Load Sub-total								1,409	61	865		
M-1	Mechanical/HVAC												
	Mechanical Pumps(Various)					170	[KW]	1			200	45	90
	FAN COILS (various)					30	[KW]	1			35	71.43	25
	AHU (various)					526	[KW]	1			619	50	309
M-2	Mechanical/Plumbing & Fire Suppression												
	SPRINKLER FIRE PUMP(s)					40	[KVA/Set]	2	[Set]		94	50	47
M-SUB	Mechanical Load Sub-total										948	50	471
	Total Estimated Load										2,357	57	1,336

3. Design Concepts

9.7 GROUNDING

A complete new grounding system will be provided in accordance with Canadian Electrical Code and the electrical inspection authority standards. All grounding conductors, clamps, bars, strap, etc. to be copper. 50mm x 6mm copper ground busses mounted on insulating stand-offs to be provided at all base building electrical and communication rooms.

Continuity of ground to all components of security, telephone system, cable television distribution system, fire alarm system, and all communications systems to be provided.

9.8 LIGHTING

Established standards and parameters for an administration facility will be used for the design of the lighting system. The Illuminating Engineering Society of North America (IESNA) standards and the University of Alberta lighting design guide will be the key references. The objective to achieve Green Globe certification will at times result in variances being made to these key references. Energy consumption considerations and lighting levels will be carefully weighed with the benefits of achieving a Green Globe certification.

The lighting power density will be designed to meet or exceed the University of Alberta's standard of 8 W/sq.ft. without impacting the light levels required by the University of Alberta.

The lighting system for the Dentistry Pharmacy Building will be designed to provide integration of numerous lighting techniques to provide vibrant and attractive atmosphere that is both inviting and engaging for the people within the space. Layered lighting within public circulation and gathering areas that will enhance the building's profile on campus. It will both augment and add to the architectural elements of the space in providing a visually stimulating environment that is comfortable and welcoming. The design will integrate the various aspects of the lighting system with the building's space functions, mechanical systems, and architectural elements.

LED lighting will be considered where feasible and in areas that may have a higher maintenance cost.

Atrium Lighting: Although the atrium space will be supplemented with large amount of natural daylight, additional lighting would be required for night time event and major architectural features. Lighting would be controlled via daylight controls within the new low voltage lighting control.

Offices and Administration Spaces: In future fit ups it is anticipated that the lighting will be a combination of recessed and suspended direct/indirect fluorescent luminaires controlled by low voltage switching.

Public Corridor: Lighting will consist of suspended fluorescent direct/indirect lighting.

Shelled space: Lighting will consist of suspended strip fluorescent luminaires mounted within each structural bay. Shell lighting shall be locally controlled at all stairwell core areas and automated to turn off during non-business hours through the scheduling within the low voltage lighting control.

All building lighting will be controlled to decrease energy use, allow flexibility, and to meet the requirements of the University of Alberta and applicable standards. The lighting control system will be a stand-alone system that will allow interface with the Building Automation System. Controls will include:

- Strategically placed daylight sensors that come with on/off controls for luminaires installed throughout all perimeter spaces.
- Occupancy sensors will be provided in all private offices, classrooms, corridors, storage rooms, washrooms, and similar spaces.
- Manual switches (digital) will be provided in all rooms for local control.
- All building lighting will be controlled using a central astrological time clock control.
- Additional control options may be included after further discussion with the University. This may include:
 - Room lighting control through local PC via building automation system.
 - Individual fixture control via the building automation system.

The general lighting source to be used in the facility will be fluorescent. A mixture of T8 and T5HO linear lamps along with LED sources will be used throughout the building. Reasonable attempts will be made to limit the number of different fixture types and lamp types, while providing good quality lighting. The rationale for using fluorescent lamps is their high lumen efficacy and color rendering properties. The building exterior lighting will be modified to meet the University of Alberta Lighting Design Guidelines in order to maintain the historical nature of the building. Fluorescent luminaires will utilize programmed start and instant start electronic ballasts with a minimum 97% power factor.

Selected luminaires in public spaces and paths of egress will be connected to the emergency power system to provide the code required egress lighting. This lighting will also operate as the 24/7 night lighting for the space.

Exit lights shall be single circuit with LEDs, 120 V fed from emergency power. It is anticipated that "EXIT" signage will utilize the new international "running person" and backlight green pending the adoption of the revisions to the Alberta Building Code.

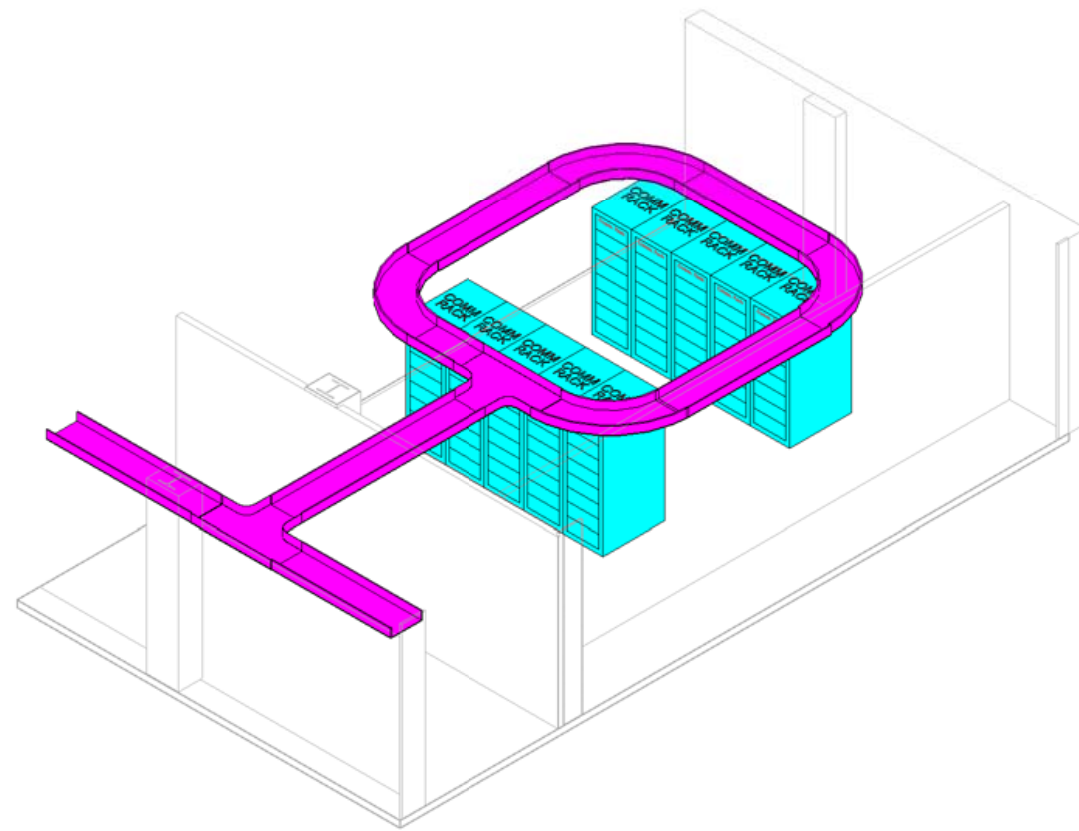
9.9 FIRE ALARM SYSTEM

A new fire alarm system will be designed for this facility. The fire alarm system will be a two-stage, voice communication, annunciated, class A-wired, and electrically supervised system.

Smoke aspiration systems such as VESDA detection systems will be required for interconnected floor spaces and ease of maintenance.

The shelled space fire alarm system will be complete with combination speaker/strobes mounted from the ceiling with a BX loop for future tenant fit up installation.

The fire alarm system will be designed with provisions to connect into the University of Alberta Mass Notification System. An audio input will be provided for "messaging capabilities".



Basement Main Communication Room ISO

9.10 LOW TENSION SYSTEMS

This section of the report discusses the various low tension and security systems that are envisioned to be installed in the Dentistry Pharmacy Building.

.1 Access Control System

It is currently envisioned that the Dentistry Pharmacy Building will be equipped with card access at the building entrances. A conduit and cabling system will be provided complete with all necessary power supplies, end devices, and electrified hardware devices.

.2 Security Television System

Security television design requires further discussion with the University of Alberta; however, it is envisioned that the building, public spaces will contain security television pan tilt zoom cameras with head end equipment located within the communication rooms.

.3 Clock System

The clock system will be an IP based system integrated with the University of Alberta mass notification system throughout the facility. Further coordination is required with the University of Alberta facilities group for final device and component architecture.

.4 Public Address System

A building wide public address system will NOT be provided.

9.11 COMMUNICATION INFRASTRUCTURE

.1 Fiber Service Requirements

The fiber service requirements for the building will be provided from two locations to ensure that there is redundancy to the building in the event that one service fails. Consultant will coordinate with the University of Alberta AICT to establish final locations.

.2 Main Communication Room – Service Entrance

Communication room to be located along the north wall of the Basement adjacent the existing utility tunnel. The new communication room will include switches for voice/data systems, racks, and associated infrastructure including cable management system and cable tray system.

.3 Communication Rooms

Three Communication Rooms located on each floor will house all the switches for data/voice and wireless infrastructure. Where required, the Communication Rooms will house IP based lighting controls, building access and controls, fire alarm and security systems. Each of these rooms will support the University of Alberta needs for equipment, cabling, and access control and will house the necessary UPS back up requirements.

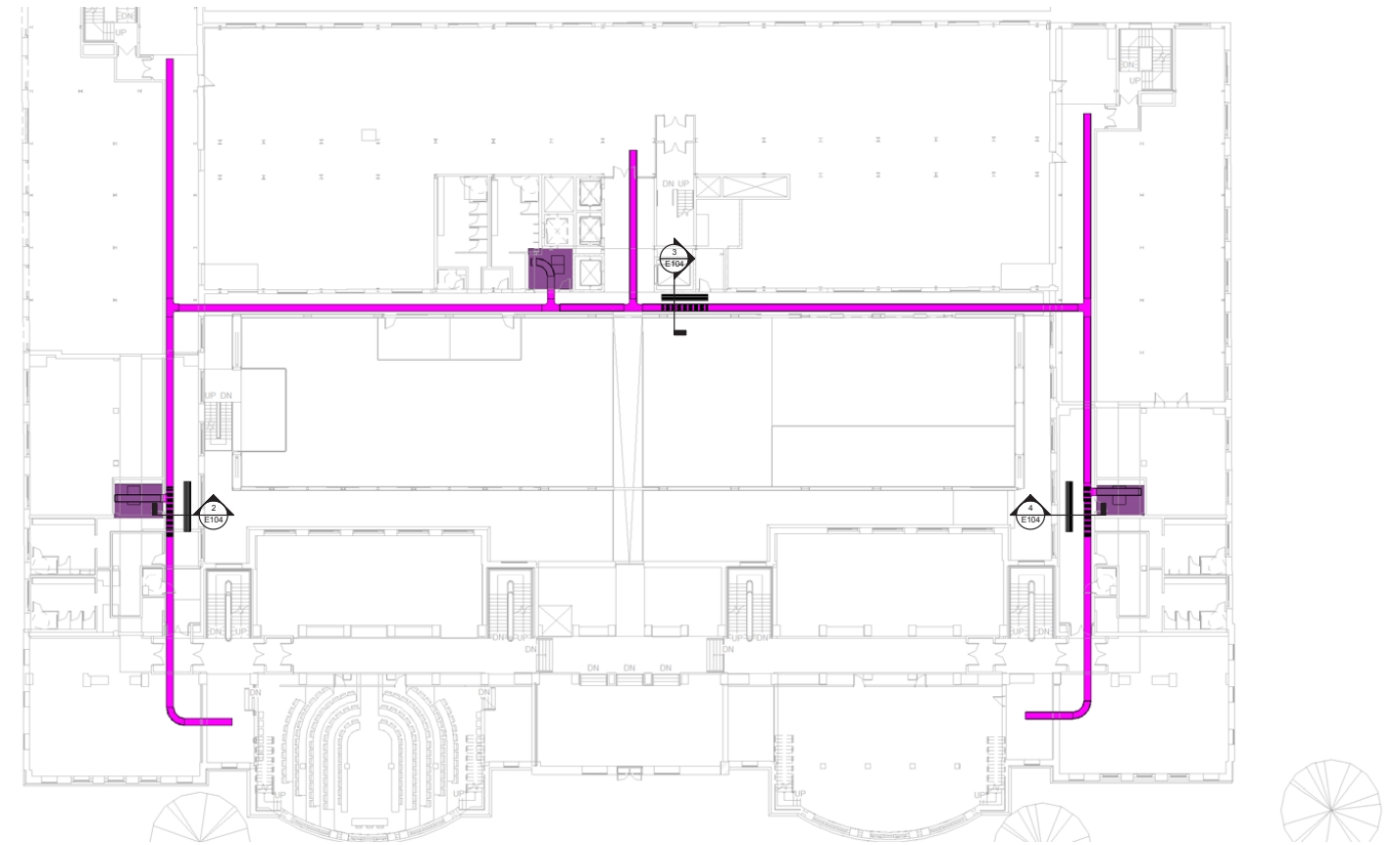
.4 Structured Cabling Pathways

Communication cabling will be installed in conduits, stubbed up to the closest cable tray and run to the designated Communications Room. Cable trays in the corridors will be 105 mm deep by 600 mm wide.

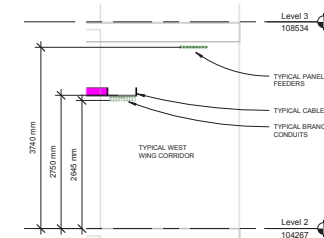
Routing of horizontal structured cabling will be accomplished by utilizing the main cable trays within the corridors, and providing conduit stubs into the ceiling space from future voice/data outlets complete with free air cabling using J-Hooks to cable tray system.

.5 Server Room

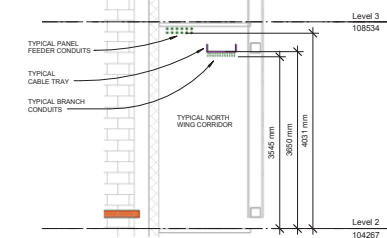
In discussions with the UofA AICT group a server room complete with UPS system will not be required. The servers and respective UPS system will be provided within each communication room on each floor.



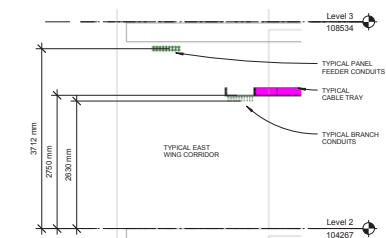
Typical Floor Cable Tray



West Wing Corridor North



North Wing Corridor East



East Wing Corridor North

9.12 MECHANICAL SYSTEMS

In general, all motors 0.37 kW and smaller will be single phase, 120 V and all motors at 0.56 kW and larger will be 600 V, 3 Phase. Supply and installation of all motor protection switches, starters, and disconnect switches for mechanical equipment will be provided. Time delay relays and power factor correction capacitors for all motors 25 hp and larger will be provided.

Variable speed drive starters for all required variable fan type motors to be provided by the mechanical contractor.

9.13 NEW BASE BUILDING ELEVATORS

Four new elevators shall be provided within the facility. New elevator machine rooms shall be incorporated in accordance with AEDARSA and Alberta Building Code Standards. Including; new services to local disconnect for power and cab lighting, Fire Alarm and Telecommunication connections to elevators cabs and within the new machine rooms.

During the course of the demolition and construction it is anticipated that the existing freight elevator shall remain operational via temporary service feeder. The freight elevator shall be replaced at the later phase of construction.

9.14 SLOWPOKE REACTOR REQUIREMENTS AND CONSTRAINTS

Refer to the SLOWPOKE Report - Appendix D.

9.15 ELECTRICAL APPENDICES

The following Electrical Drawings are in Appendix E:

- .1 Electrical Site Plan Layout
- .2 Basement Electrical Room Key Plan
- .3 Basement High Voltage Substation/Service Entrance Room
- .4 High Voltage Substation Details and Elevations
- .5 Basement Main Communication
- .6 Typical Electrical and Communication Room Key Plans
- .7 Typical Floor Cable Tray
- .8 Typical Floor Cable Tray Details
- .9 Typical Floor Electrical and Communication Rooms
- .10 Electrical Single Line Diagram
- .11 Electrical Room Riser Diagram
- .12 Communication Room Riser Diagram
- .13 Fire Alarm Riser Diagram

INTRODUCTION

The University of Alberta Dentistry and Pharmacy Building Redevelopment's atrium is a seven-storey space that will act as an informal meeting and interaction area with high levels of pedestrian traffic, and that will allow access to views and natural light by incorporating interior glazing, and exterior windows, as shown in the rendering in Figure 1. Because of the sound-reflective nature of many of the surfaces in the space, an important acoustical concern will be the prevention of excessively high reverberation levels, which can result in acoustical discomfort within the space. Adequate control of background noise from mechanical heating and ventilation systems is also necessary for good speech intelligibility and to support a feeling of calmness for this large atrium space.



Figure 1 – Atrium Rendering

BACKGROUND

Acoustical treatment is generally required in spaces where echoes caused by long delays and multiple reflections degrade the level of speech intelligibility within a room. A public space that is too reverberant can become noisy, and make it difficult to communicate. The quality of speech intelligibility is dependent on the rate at which sound decays within the space (reverberation time). With excessive reverberation, sound reflections result in a mixing of speech sounds, (i.e., when reflections mix with direct sound), causing a blurring of speech syllables and a reduction in speech intelligibility. Further, reflections that reach the listener from the more distant surfaces will be perceived as echoes. Limiting the opportunity for such echoes by incorporating sufficient areas of absorption in the atrium will lead to a greater feeling of intimacy for small groups meeting or chatting together within the space.

Speech comprehension generally benefits from low reverberation times; quiet background noise conditions are also essential for speech intelligibility and acoustic comfort. The background noise level from mechanical systems should be from NC 35 to NC 40.

The reverberation time is typically specified by an RT60 value, which is defined as the time required for the sound level to drop 60 decibels after an impulse. Typically, larger spaces require a greater area of acoustically absorptive finishes to achieve an appropriate reverberation time. Acoustic treatment is also important for the control of the propagation of sound throughout a space and to adjoining, coupled spaces. Sound absorptive finishes in adjoining corridors are also recommended to provide freedom from disturbance.

ANALYSIS

The acoustic performance of the Atrium was evaluated using ODEON Room Acoustics software, as shown in Figure 2. The acoustic model was constructed based on the Schematic Design Sketchup model dated September 19, 2012. The Lobby has been evaluated in terms of reverberation time for several conditions. The result for the current design is presented in Figure 3.

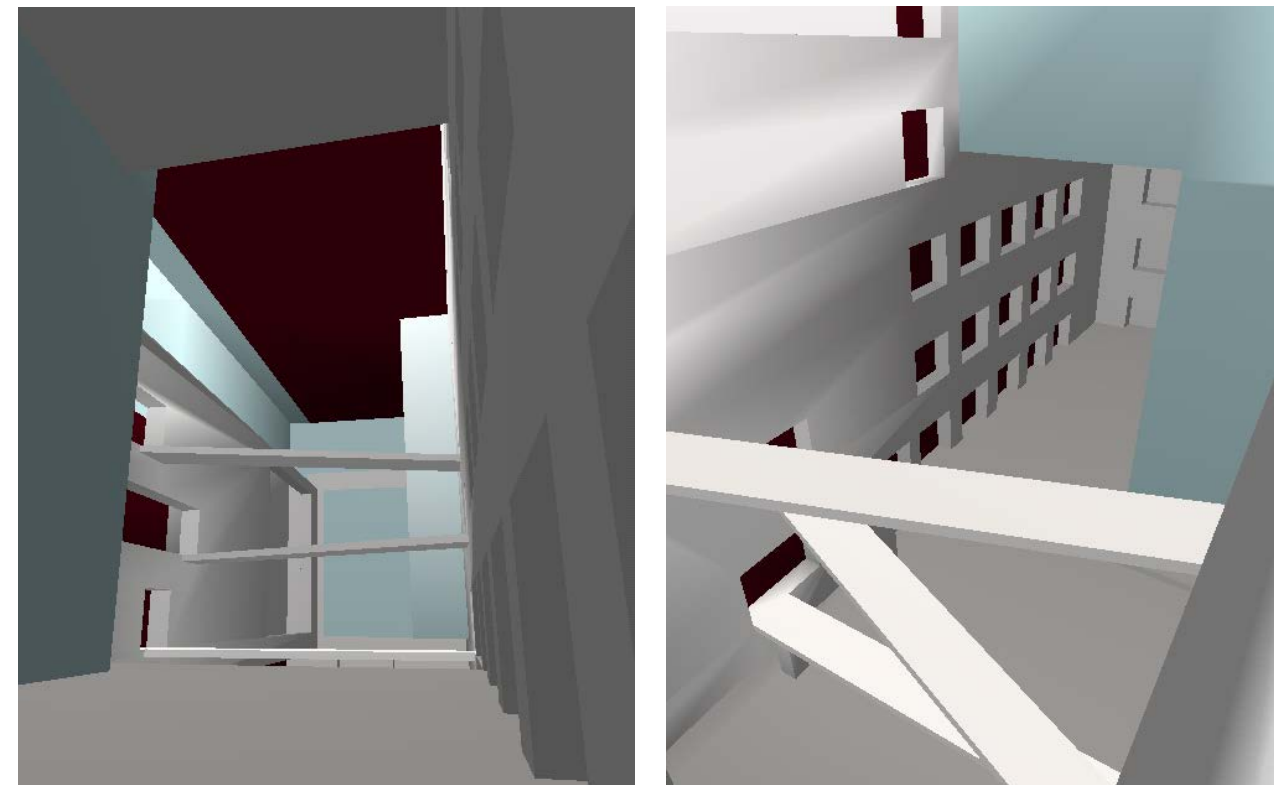
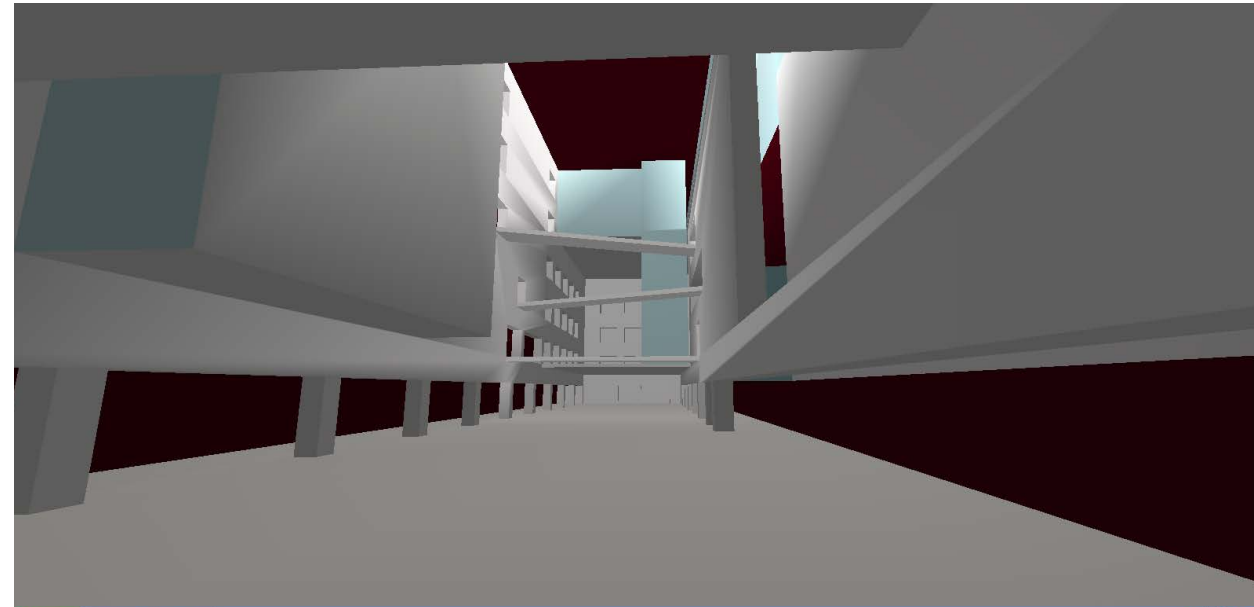


Figure 2 – ODEON Model of Atrium Space

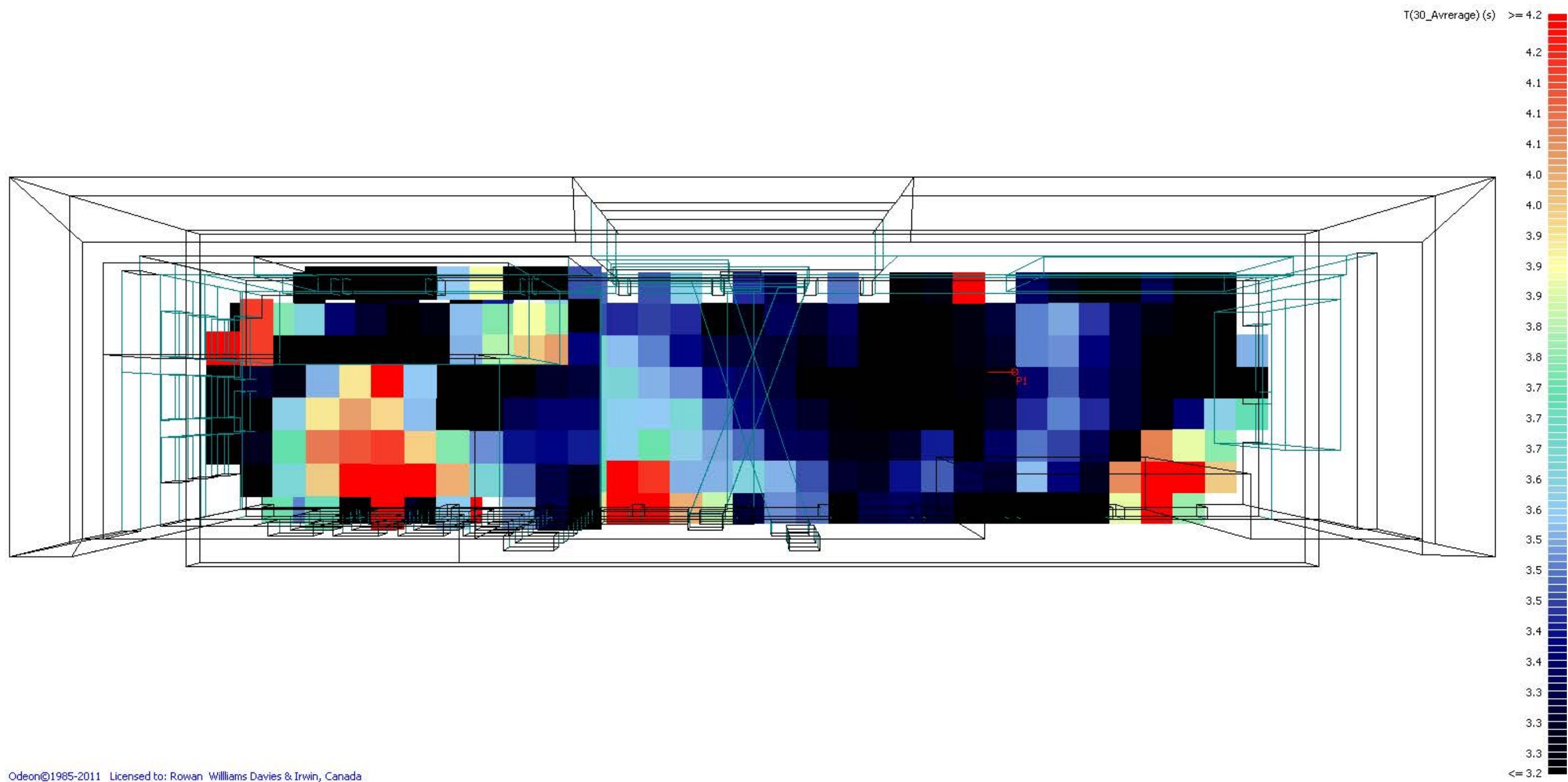


Figure 3 – Reverberation Time (RT60) Plot of Proposed Finishes (3 to 4 seconds)

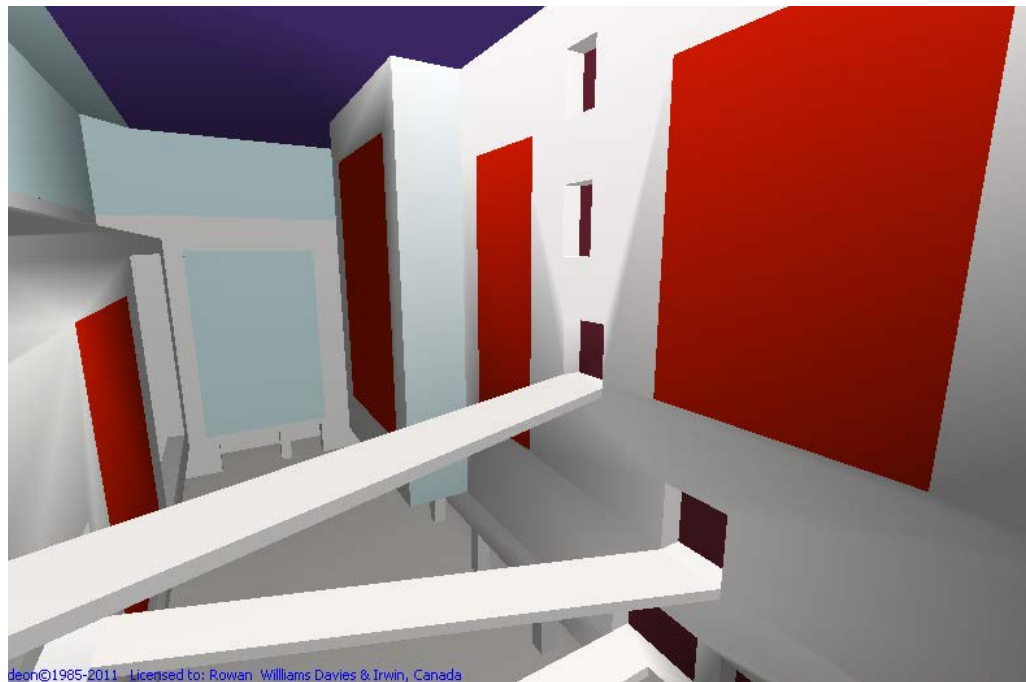
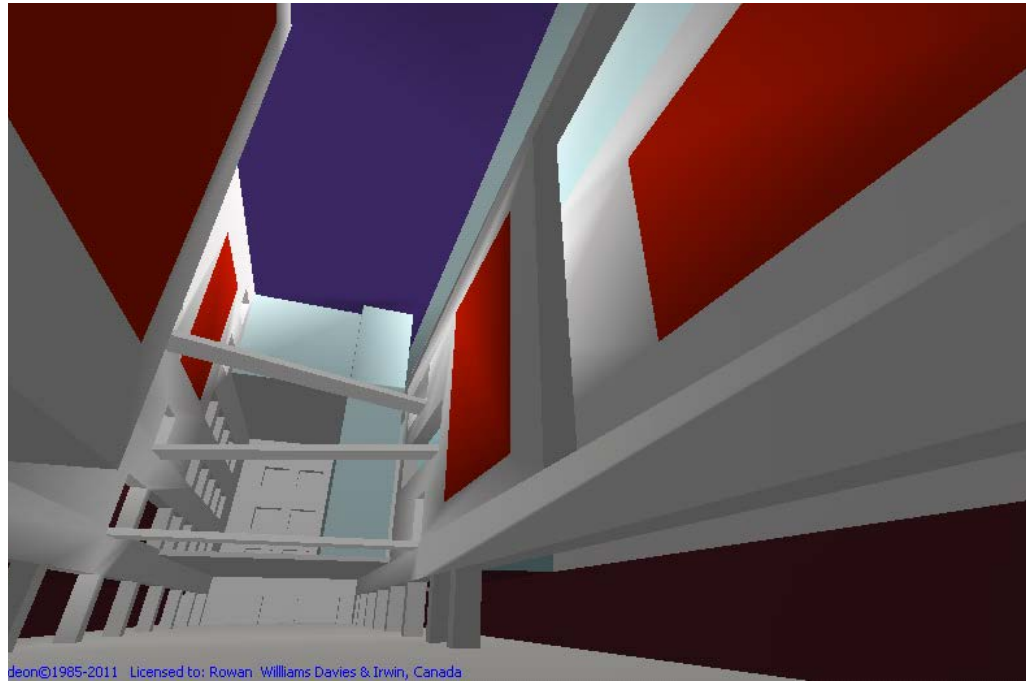


Figure 4 – Example Placement of 600 m² of Acoustical Wall Panels

RECOMMENDATIONS

In addition to the acoustic wood slat ceiling (as shown in purple in Figure 4), we have examined the reverberation times that would result from adding 600 m² of acoustic finishes (as shown in red in Figure 4) having a Noise Reduction Coefficient (NRC) of about 0.7. There are many acoustic products available to suit a desired aesthetic (i.e. plaster, wood, metal, and stone). The corresponding reverberation time is shown in Figure 5.

Adding a total of about 600m² of acoustically absorptive finishes, both in the interior of the atrium and in the outer coupled volume, provides a significant reduction in reverberation time – on average, from 3.5 to 2.5 seconds overall, and will improve speech intelligibility within the space. Speech intelligibility depends on the mechanical system background noise, the reverberant level in the room, and the direct noise created by competing conversations from various groups within the atrium.

The effect of adding an additional 600m² of acoustic finishes would be to improve speech intelligibility from poor to fair for many common situations, particularly those involving small groups of persons standing together or speaking together around a table, when the number of persons in the atrium exceeds about fifty, and when the distance from the speaker to the listener is about 2m or more. Providing this degree of absorption and control of reverberance will result in a space with fair to good speech intelligibility during periods of relatively high usage.

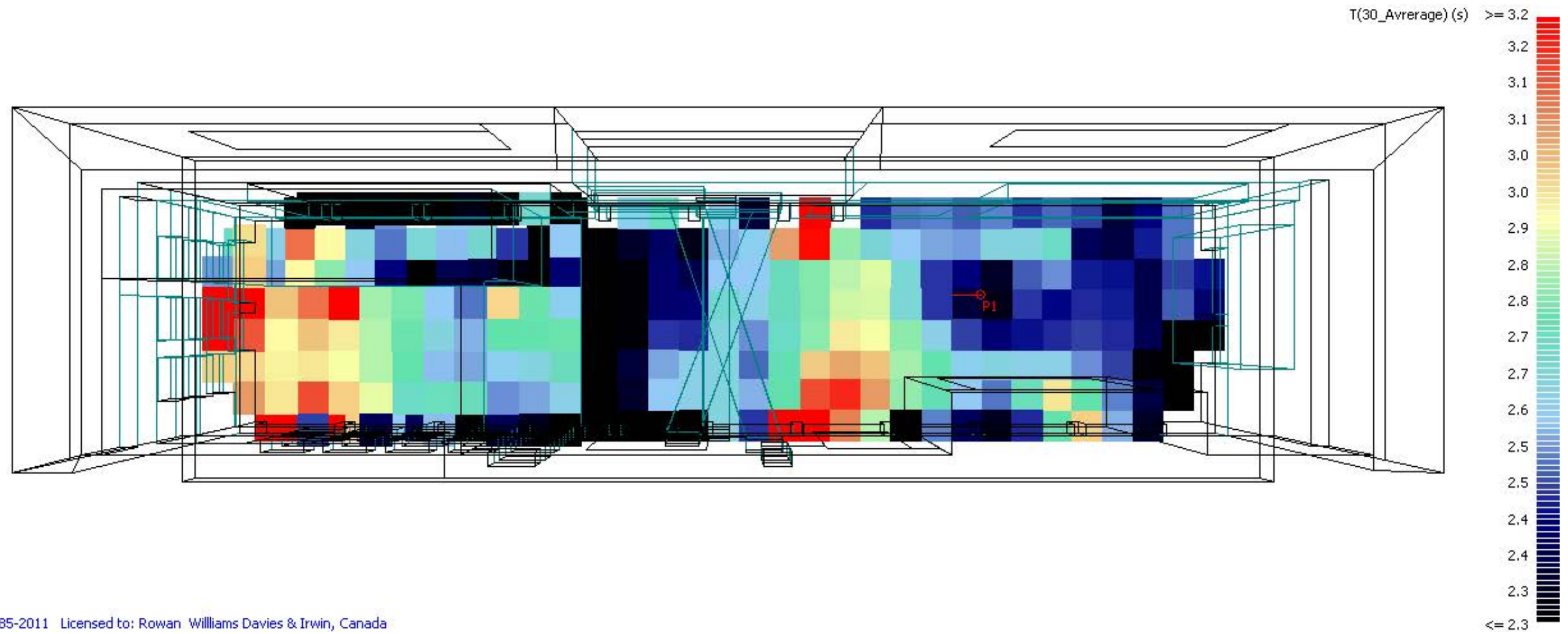


Figure 5 – Reverberation Time (RT60) Plot with Additional Acoustic Finishes (2 to 3 seconds)

CIVIL / LANDSCAPE

The improvement of building accessibility requires the careful adjustment of the area south of the building.

Providing accessible entrances to the south side of the building that are natural and support the goals of the project requires a regrading of this area to create a public plaza.

The regrading recognizes and protects the existing trees in front of the building as much as possible. The existing LRT access pavillion in front of the building will be lowered with the regrading and redesigned to minimize its impact on the main south facade. The regrading will require introduction of storm water control and collection to provide safe walkways.

The development of loading to service this building in the SAB courtyard will require minimal modification of storm drainage in this area.

The future redevelopment of the roadway north of the building and of the North Power Plant is supported by the introduction of a pedestrian scale canopy along the north face of the building. Grading changes along the building will be considered with the introduction of the canopy structure and removal of all tress along the face of the 1958 Building will be required.





- *Schedule Overview*
- *Cost Plan*

Dentistry Pharmacy – Schedule Overview

Overview

A preliminary schedule has been prepared for the Dentistry Pharmacy project and it is based on the following assumptions and strategies:

- The project has been broken down into Phases that are containable and logical to complete the overall renovation,
- Each Phase will require review and approval of the University, we have not included review and approval timelines within the preliminary schedule,
- Each Phase follows sequentially with no overlap in the preliminary schedule, each subsequent Phase starts one month after the prior Phase is complete as a baseline:
 - It would be possible to overlap the Phases and accelerate the project if funding and review/approvals can be obtained to allow overlap to occur,
 - It is possible to increase the delay between Phases if funding and approval requirements dictate that increased delay is required.
- We have included a schedule item for construction documentation within each Phase,
- We have included a schedule item for the selection of a construction manager for:
 - Phase II – Selective Demolition,
 - Phase III and IV - construction of the shell and core with the atrium structure, new mechanical penthouse, building envelope upgrades and interior shell construction,
 - Phase V – Tenant fit-up, construction of the council chambers and construction of the final Slopoke space,
 - It should be noted that the interior space can be constructed as multiple tenant fit-up packages by multiple contractors if desired.

The phasing strategy has also been developed to facilitate risk, cost and cash flow management:

- As noted above, each phase can be initiated and completed separately, building off the knowledge and experience gained in the previous phases,
- Each phase can be adjusted in duration to some degree to respond to cash flow restrictions if present.

- In the event that multiple phases can be overlapped there would be some reduction on the overall cost of the general expense associated with each phase, primarily in the mobilization/demobilization elements and time dependent costs. Cost savings with respect to Phasing are not likely to be significant as there will not be a lot of equipment, offices etc. that will need to be mobilized as the existing facility can be used for construction offices etc. and the majority of the staging can be accommodated within the existing courtyards minimizing the requirement for excessive temporary site work.

Phase I – Preparation

The first Phase of the project is basic preparation, the critical elements are:

- Isolation of Slopoke and modification to allow Slopoke to function effectively while the balance of the renovation progresses,
- Decanting of the facility. The strategy is to fully decant the existing building to allow the selective demolition to proceed in the most cost effective manner possible,
- Reconstruction of the SAB link,

The decanting of the facility has already started and it is anticipated the decanting will continue as existing users relocate to other facilities. It is also assumed that no new groups will be occupying space within the facility. The majority of the decanting will occur between May and October of 2013, after the winter term ends.

Phase II – Selective Demolition and Pre-order of Major Equipment

The plan is to complete selective demolition throughout the entire building in a single Phase to most effectively manage the demolition cost and to provide adequate time to address any unknowns that arise during the demolition Phase. During this Phase the critical elements include:

- Installation of temporary mechanical and electrical service and distribution to allow all existing mechanical and electrical systems to be completely removed,
- Demolition and removal of all hazardous materials,
- Selective demolition of all interior finishes:
 - Note that the center wing will not be demolished during this Phase to avoid the need to undertake significant protection of the below grade link, Slopoke and the vertical areas that will be exposed when the center link is demolished. This provides maximum

- No work on the building exterior will be undertaken during this Phase,
- Pre-ordering of the major mechanical and electrical equipment,
- Pre-ordering of the elevators.

During this Phase the contractor will be able to set-up within the existing facility in a number of locations. The demolition contractor/construction manager will be the only group working within the facility and will therefore have full control and unencumbered access to all areas of the building. The staging area can be fully contained within the existing courtyards and all demolition material can be removed through standard garbage chutes and bins that are removed through the two access links. There is no requirement to provide staging external to building thereby minimizing any disruption to the adjacent facilities.

At the end of the demolition Phase the building will be clean and bare, all unknown conditions will have been identified and addressed through remedial action or design adjustment to cost effectively address any issues:

- The building will have basic temporary electrical distribution and basic climate control to ensure that the building can be maintained as empty space,
- It is important to recognize that the building will not have any sprinklers at the end of this phase and a temporary fire alarm system will be installed.

Phase III – Basic Shell Construction

This Phase includes several key elements:

- Demolition of the 7th level,
- Demolition of the center link,
- Construction of the new atrium foundation, structure and envelope,
- Reinforcement of the existing roof structure where required and re-roofing of the existing roof,
- Removal of the existing elevators and installation of the new elevators,
- Mechanical and Electrical systems:
 - Construction of the new mechanical penthouse,
 - Construction of the new main service rooms in the basement,
 - Installation of the new major mechanical equipment,
 - Installation of the new electrical distribution and major equipment.

Construction of the Phase is expected to take approximately 16 to 18 months. There are several things that should facilitate a relatively smooth construction period:

- All interior demolition has been completed in Phase II and any surprises that may have arisen have been able to be dealt with effectively.

- The entire building is fully exposed, and clean, thereby allowing the constructor to work on multiple floors installing major mechanical and electrical distribution if possible. The constraint will be labour availability, not access or unknown conditions. As a result the work can proceed in the most cost effective method and rate,
- Staging and delivery will be contained to the north side of the building,
- The interior elevators can be retrofit in a sequential manner thereby, providing. Vertical elevating throughout the entire construction period, no temporary elevating will be required,
- The major mechanical equipment can be hoisted into place, most likely in sections from the north side access.

Phase IV – Core and Shell Completion

In Phase IV the shell is completed so as to be ready for tenant fit-up in Phase IV. Major elements include:

- Exterior glazing replacement, the window replacement can proceed throughout the year,
- Completion of the mechanical and electrical systems,
- Completion of interior shell finishes, floor, ceiling and wall preparation,
- Completion of the service spaces such as washrooms, mechanical, electrical and communication rooms and other support space.
- Completion of the circulation corridors, floor, wall, ceiling and mechanical electrical finishes,
- Completion of the atrium finishes,
- Exterior façade repair and repointing. This work can be completed over two spring/summer/fall seasons. Completing this work with genie lifts in clement weather will provide the best strategy to ensure good productivity, good quality and the lowest cost,
- Entrance construction and rehabilitation,
- Landscape restoration and construction of the new front entry landscape area.

This Phase is expected to take approximately 18 months in total construction duration. The total duration of Phase III and IV could be compressed by overlapping these Phases if financial constraints permit. It is possible that the total duration could be reduced by 4 to 6 months cost effectively.

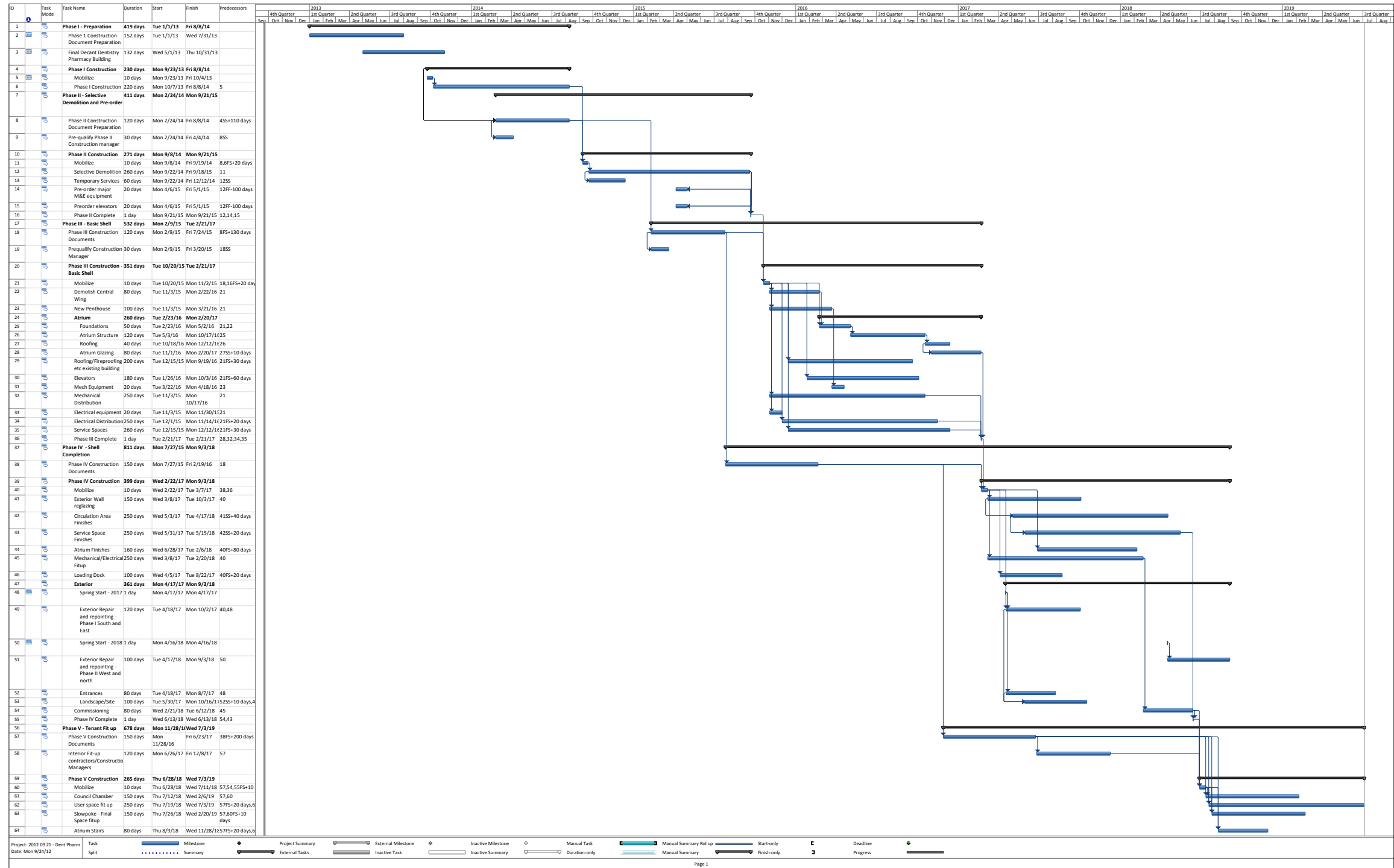
Phase V

Phase V is the final construction period that includes:

- Tenant fit-up of all occupied spaces,
- Completion of the Council Chambers,
- Completion of the final Slopoke space,

With the shell fully completed in Phase IV the entire building will be available for construction of the tenant spaces. It is likely that the spaces will be fit-up on a tenant by tenant basis and multiple tenant finish contractors could complete the work. All staging and material handling will be coordinated through the new loading dock facilities and freight elevator.

It is possible that tenant fit-up could be overlapped with the shell construction in Phase IV resulting in an overall reduction in the total duration of Phase IV and V of up to 6 months if planning and financial constraints permit.



Dentistry Pharmacy Building Redevelopment University of Alberta Schematic Design Report - Cost Plan 2 Rev 1					
Summary				Subtotal	Total
1 Phase 1					2,738,000
2 Phase 2					23,313,000
3 Phase 3					58,063,000
4 Phase 4					30,811,000
5 Phase 5					50,335,000
Subtotal					165,260,000
6 Contingencies					24,789,000
6.1 Design Contingency	5%			8,263,000	
6.2 Construction Contingency	10%			16,526,000	
Total Construction Cost	34,500	m2	5,508.67		190,049,000

Dentistry Pharmacy Building Redevelopment University of Alberta Schematic Design Report - Cost Plan 2 Rev 1				
Description	Quantity	Unit	Unit Rate	Amount
1.0 Phase One				
➤ Dentistry Pharmacy Building UA final decant				
➤ Initial demolition				
➤ SLOWPOKE isolation				
➤ SAB Link reconstruction				
➤ Council Chamber (EOC) preparation				
1.1 Isolation for Slowpoke				
Temporary Access	1	ls	100,000.00	100,000
New Corridor to future Lab Space	1	ls	250,000.00	250,000
Mechanical and Electrical Services				
Mechanical	1	ls	800,000.00	800,000
Electrical	1	ls	500,000.00	500,000
1.2 Temporary Offices and Storage	116	m2	1,500.00	174,000
1.3 Temporary Electrical Room	100	m2	2,500.00	250,000
1.4 Council Chamber preparation				NIC
1.5 SAB Link Re-construction				NIC
Subtotal Direct Construction Costs				2,074,000
1.6 Indirect Costs				
General Expenses	20%			415,000
Fee	10%			249,000
1.0 Total for Phase 1				2,738,000

4. Phasing and Budget

Dentistry Pharmacy Building Redevelopment University of Alberta Schematic Design Report - Cost Plan 2 Rev 1				
Description	Quantity	Unit	Unit Rate	Amount
2.0 Phase Two				
<ul style="list-style-type: none"> ➢ Selective Demolition including Haz Mat removal ➢ Decommissioning of Dentistry Pharmacy Building ➢ Temporary Servicing of Dentistry Pharmacy Building ➢ Preorder major mechanical equipment ➢ Preorder major electrical equipment ➢ Preorder elevators ➢ Prequalify mechanical and electrical contractors 				
2.1 HAZMAT Removals				
Asbestos, Mercury, Lead, PCB	31,100	m2	110.00	3,421,000
2.2 Selective Interior Demolition				
Finishes, Mechanical and Electrical	31,100	m2	150.00	4,665,000
Disconnect M and E services to remainder building	1	ls	100,000.00	100,000
2.3 Temporary Services				
Heating and Ventilation	36	mos	25,000.00	900,000
Power and Lighting	36	mos	10,000.00	360,000
Temporary Fire Alarm System for the Building	1	ls	200,000.00	200,000
2.4 Pre-order major Mechanical Equipment	1	ls	3,000,000.00	3,000,000
2.5 Pre-order major Electrical Equipment	1	ls	5,500,000.00	5,500,000
2.6 Pre-order Elevators	1	ls	3,000,000.00	3,000,000
				21,146,000
Subtotal Direct Construction Costs				
2.7 Indirect Costs				
General Expenses	5%			1,057,000
Fee	5%			1,110,000
2.0 Total for Phase 2				23,313,000

Dentistry Pharmacy Building Redevelopment University of Alberta Schematic Design Report - Cost Plan 2 Rev 1				
Description	Quantity	Unit	Unit Rate	Amount
3.0 Phase Three				
<ul style="list-style-type: none"> ➢ Demolition of central wing ➢ Basement deepening ➢ Foundations ➢ Atrium structure ➢ Penthouse roof structure ➢ Roof structure 22/46/47 Buildings ➢ Atrium glazing ➢ Penthouse paneling ➢ Roofing: new and existing roof areas ➢ Stairs ➢ Elevators ➢ Mechanical major equipment ➢ Mechanical main distribution ➢ Electrical major equipment including Generator ➢ Electrical main distribution ➢ Basement main service rooms ➢ Service spaces: washrooms, electrical and communication rooms. 				
3.1 Demolition of Central Wing to Ground Level	1,700	m2	750.00	1,275,000
3.2 Remove Roof and Wall for New Mechanical Room	1,500	m2	330.00	495,000
3.3 Atrium				
Foundations	1,900	m2	750.00	1,425,000
Slowpoke Protection	1	ls	100,000.00	100,000
Main Floor slab	1,900	m2	250.00	475,000
Structural Steel Roof Structure with Intumescent Paint	500	tones	5,000.00	2,500,000
Rigging Points for Window Washing and Slowpoke	1	ls	250,000.00	250,000
Structural Steel Walkway and Floor Structures	1,500	m2	1,100.00	1,650,000
Fireproofing Walkway and Floor Structures	1,500	m2	110.00	165,000
Roofing	1,900	m2	330.00	627,000
Exterior Wall	1,350	m2	2,700.00	3,645,000
Sunshades	700	m	450.00	315,000
3.4 Modifications to Existing Building				
Basement modifications	900	m2	1,000.00	900,000
Structural Upgrading	1	ls	1,000,000.00	1,000,000
New Mechanical Room				
Structure	85	tones	5,000.00	425,000
Roof Deck and Roofing	1,500	m2	330.00	495,000
Cladding	1,200	m2	650.00	780,000

Dentistry Pharmacy Building Redevelopment University of Alberta Schematic Design Report - Cost Plan 2 Rev 1				
Description	Quantity	Unit	Unit Rate	Amount
Finishes	1,500	m2	550.00	825,000
New Elevator Shafts	1,200	m2	550.00	660,000
Floor leveling and patching	3,100	m2	150.00	465,000
In-fill and make new openings	1	ls	500,000.00	500,000
Fireproofing	19,281	m2	75.00	1,446,000
Fireproofing Attic Structure	4,000	m2	75.00	300,000
3.5 Roofing				
Re-roof existing Building	4,000	m2	275.00	1,100,000
Fall Arrest System	1	ls	250,000.00	250,000
Green Roof system - NIC	1	ls	0.00	0
3.6 Vertical Transportation				
Elevators - installation	26	stops	35,000.00	910,000
Re-finish Stairwells	24	levels	100,000.00	2,400,000
New Stairs	256	risers	2,000.00	512,000
3.7 Service rooms				
Washrooms	1,300	m2	2,700.00	3,510,000
Electrical and Communication Rooms	700	m2	1,100.00	770,000
Duct shafts	1	ls	500,000.00	500,000
3.8 Base Building Mechanical Systems	31,100	m2	490.00	15,239,000
3.9 Base Building Electrical Systems	31,100	m2	100.00	3,110,000
				49,019,000
Subtotal Direct Construction Costs				
3.10 Indirect Costs				
General Expenses	15%			7,353,000
Fee	3%			1,691,000
3.0 Total for Phase 3				58,063,000

Dentistry Pharmacy Building Redevelopment University of Alberta Schematic Design Report - Cost Plan 2 Rev 1				
Description	Quantity	Unit	Unit Rate	Amount
4.0 Phase Four				
➤ Exterior wall glazing replacement 22/46/47 Buildings				
➤ Repair and repointing 22/46/47 Buildings				
➤ Entrances 22/46/47 Buildings				
➤ North roadway				
➤ Exterior wall glazing, repair, and entrances 58 Building				
➤ Atrium finishes				
➤ Loading dock				
➤ South entrance regarding				
➤ Civil				
➤ Landscaping				
4.1 Exterior Wall Modifications				
Remove Windows	2,432	m2	350.00	851,000
4.2 Atrium Finishes				
Atrium Finishes	1,700	m2	1,100.00	1,870,000
Welcome Centre	200	m2	5,500.00	1,100,000
Shared Spaces	1,200	m2	2,200.00	2,640,000
Acoustics	1	ls	1,000,000.00	1,000,000
Mechanical System	3,400	m2	350.00	1,190,000
Electrical System	3,400	m2	350.00	1,190,000
4.3 Exterior Wall				
New Windows (non-opening) and Sills	2,432	m2	1,100.00	2,675,000
Re-point and clean existing Wall	19,600	m2	110.00	2,156,000
Repair existing Brick	2,000	m2	500.00	1,000,000
Plaster	19,600	m2	150.00	2,940,000
4.4 Re-construct Entrances and New Entrances	1	ls	1,000,000.00	1,000,000
4.5 New Loading Dock	1	ls	500,000.00	500,000
4.6 Site Works				
Remove and store existing entrance stonework	1	ls	100,000.00	100,000
Remove Trees	1	ls	50,000.00	50,000
Regrading, Utilities and Soft and Hard Landscaping	1	ls	5,000,000.00	5,000,000
Site Furniture	1	ls	250,000.00	250,000
Site Lighting	1	ls	500,000.00	500,000
				26,012,000
Subtotal Direct Construction Costs				

4. Phasing and Budget

Dentistry Pharmacy Building Redevelopment University of Alberta Pre-Design Report - Cost Plan 2				
Description	Quantity	Unit	Unit Rate	Amount
4.7 Indirect Costs				
General Expenses	15%			3,902,000
Fee	3%			897,000
4.0 Total for Phase 4				30,811,000

Dentistry Pharmacy Building Redevelopment University of Alberta Schematic Design Report - Cost Plan 2 Rev 1				
Description	Quantity	Unit	Unit Rate	Amount
5.0 Phase Five				
<ul style="list-style-type: none"> > Council Chamber construction and finishes > Mechanical TI fit out > Electrical TI fit out > SLOWPOKE final installation > User Fit Ups 				
5.1 Architectural Finishes				
Drywall to Exterior Walls	19,600	m2	150.00	2,940,000
Partitions	31,100	m2	200.00	6,220,000
Circulation	6,700	m2	440.00	2,948,000
Office Areas	19,000	m2	660.00	12,540,000
Council Chamber	400	m2	5,500.00	2,200,000
Historical Retrofit	1,600	m2	2,200.00	3,520,000
Slowpoke final installation	509	m2	1,650.00	840,000
5.2 Mechanical Finishes	31,100	m2	275.00	8,553,000
5.3 Electrical Finishes	31,100	m2	150.00	4,665,000
Subtotal Direct Construction Costs				44,426,000
5.4 Indirect Costs				
General Expenses	10%			4,443,000
Fee	3%			1,466,000
5.0 Total for Phase 5				50,335,000

Dentistry Pharmacy Building Redevelopment University of Alberta Schematic Design Report - Cost Plan 2 Rev 1		
Description	Amount	
Total for Mechanical System		
Phase 1		800,000
Phase 2		3,000,000
Phase 3		15,239,000
Phase 4		1,190,000
Phase 5		8,553,000
		<u>28,782,000</u>
Icon Industrial Contractors total budget	28,800,000	
Total Mechanical as unit cost of floor area	\$ 834.26	per m2
Total Mechanical as % of total construction cost	17.42%	
Total for Electrical System		
Phase 1		500,000
Phase 2		5,500,000
Phase 3		3,110,000
Phase 4		1,190,000
Phase 5		4,665,000
		<u>14,965,000</u>
Territorial Electrical Contractors total budget	14,495,000	
Total Electrical as unit cost of floor area	\$ 433.77	per m2
Total Electrical as % of total construction cost	9.06%	
Total for General Expenses		
Phase 1		415,000
Phase 2		1,057,000
Phase 3		7,353,000
Phase 4		3,902,000
Phase 5		4,443,000
		<u>17,170,000</u>
Total General Expenses as unit cost of floor area	\$ 497.68	per m2
Total General Expenses as % of total construction cost	10.39%	

Dentistry Pharmacy Building Redevelopment University of Alberta Schematic Design Report - Cost Plan 2 Rev 1	
Clarifications and Assumptions	
1	This Cost Plan has been prepared based on Design information provided by Stantec upto September 2012
2	This Cost Plan is based on current dollars. Escalation contingency is not included
3	Phasing of construction has been included in this Cost Plan.
4	Except for the Slowpoke, this Cost Plan assumes that the entire building will be vacant
5	Storage costs of pre-ordered Mechanical and Electrical Equipment are not included
6	Extended Warranties on pre-ordered Mechanical and Electrical Equipment are not included
7	The University will provide Natural Gas and Power consumed during construction at no cost
8	The following items have not been included in this Cost Plan: GST Design Fees and Inspections Link LRT Connection and Re-cladding Furniture, Fixtures and Equipment Signage Security System, except for rough-ins Audio-Visual systems, except for rough-ins North Entrance Canopies Extended Atrium

4. Phasing and Budget



As this project moved from Pre-Design to Schematic Design the ASU Best Value Process continued to be used. The identification of risk and mitigation of those risks was ongoing. As more investigation and design took place the level of risks that had been identified were being reduced for the most part.

At this time a number of risks are being monitored as the design progresses but an increased risk to the successful completion of the project has not been noted. The following represent some of those areas.

- atrium structure.
- budget and phasing.
- over subscription of user space needs.
- introduction of additional scope related to the South Academic Building Link and LRT improvements.

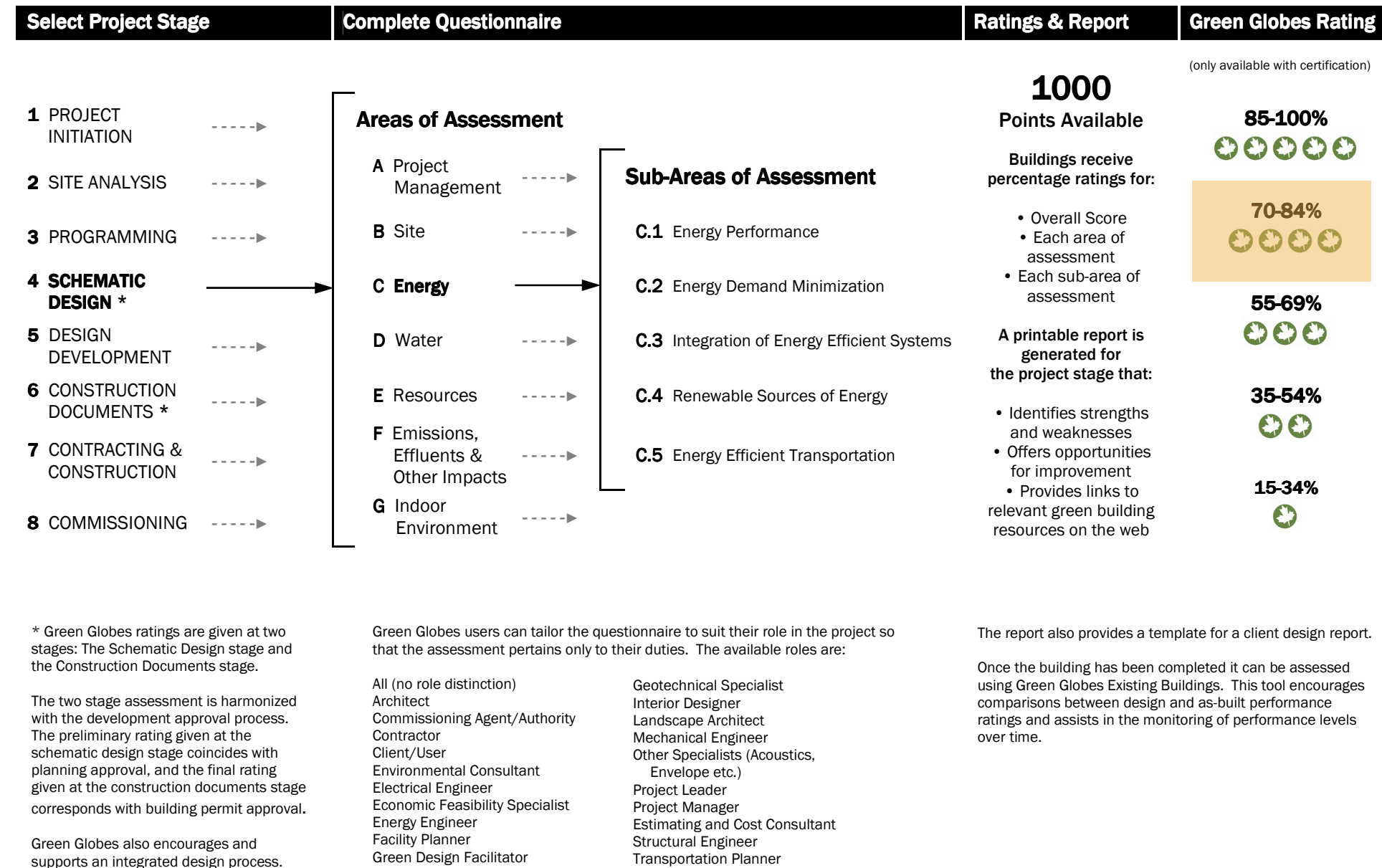


- *Green Globes Design Organizational Structure*
- *Green Globes Design Points System*

GREEN GLOBES

The University is targeting Green Globes “4 Globe” rating which is a score of between 70% and 84% of their possible 100% marking system. The sustainable initiatives will address all areas of the rating system. There will be particular attention paid to the energy category although building envelope and materials engineering issues around the stability of masonry walls will require leaving the walls without insulation to ensure continued stability of the material. The particular responses to each category of the sustainable objectives will be detailed throughout design development.

The Green Globes Design™ Organizational Structure



6.2 GREEN GLOBES

The Green Globes Design Points System

Percentage Score	Points Score	Areas and Sub-Areas of Assessment
5%	50	A - Project Management
	20	A.1 - Integrated design process
	10	A.2 - Environmental purchasing (including energy efficient products)
	15	A.3 - Commissioning
	5	A.4 - Emergency response plan
11.5%	115	B - Site
	30	B.1 - Development area (site selection, development density, site remediation)
	30	B.2 - Ecological impacts (native planting and vegetation, heat islands, night sky)
	20	B.3 - Watershed features (site grading, stormwater management, pervious cover, rainwater capture)
	35	B.4 - Site ecology enhancement
38%	380	C - Energy
	100	C.1 - Energy performance
	114	C.2 - Reduced energy demand (space optimization, microclimatic response to site, day-lighting, envelope design, metering)
	66	C.3 - Integration of energy efficient systems
	20	C.4 - Renewable energy sources (on-site renewable energy technologies)
	80	C.5 - Energy-efficient transportation (public transportation, cycling facilities)
8.5%	85	D - Water
	30	D.1 - Water performance
	45	D.2 - Water conserving features (sub-metering, devices, cooling towers, landscaping and irrigation strategies)
	10	D.3 - On-site treatment of water (greywater system, on-site wastewater treatment)
10%	100	E - Resources
	40	E.1 - Low impact systems and materials (selection of building materials based on the low environmental impact)
	15	E.2 - Minimal consumption of resources (reused, recycled, local, low-maintenance materials, certified wood)
	15	E.3 - Reuse of existing buildings
	15	E.4 - Building durability, adaptability and disassembly
	5	E.5 - Reduction, reuse and recycling of demolition waste
	10	E.6 - Recycling and composting facilities
7%	70	F - Emissions, Effluents & Other Impacts
	15	F.1 - Air emissions (low emission burners)
	20	F.2 - Ozone depletion
	10	F.3 - Avoiding sewer and waterway contamination
	25	F.4 - Pollution minimization (storage tanks, PCBs, radon, asbestos, pest management, hazardous materials)
20%	200	G - Indoor Environment
	55	G.1 - Ventilation system (intakes, ventilation rates, delivery, CO ₂ monitoring, controls, parking areas, ease of maintenance)
	45	G.2 - Control of indoor pollutants (mould, AHU, humidification, Legionella cooling towers/ hot water, building materials, local exhaust)
	50	G.3 - Lighting (visual access, heights & depths of perimeter spaces, daylight factor, ballasts, glare, task lighting, controls)
	20	G.4 - Thermal comfort (thermal conditions meet ASHRAE 55)
	20	G.5 - Acoustic comfort (zoning, transmission, vibration control, acoustic privacy, reverberation, mechanical noise)
100%	1000	TOTAL POINTS AVAILABLE

6.3 ENERGY MODEL

A preliminary energy model has been developed as part of the mechanical system design. The model assumes there is no insulation added to the interior of the masonry walls. This is consistent with the recommendations of the Building Envelope Report in maintaining a stable material environment for the existing masonry. There was concern that the energy profile would be quite poor for a large office building in this climate. However, the energy model shows a different result. Using an office building of similar size and configuration as a baseline, the model shows a significant 30% improvement in energy performance! This is due to several factors: improvement in the insulation quantities and configuration in the roof, high performance windows, an efficient energy recovery system in the mechanical design, the creation of the atrium that significantly alters the building's external exposure and provides a much more compact spatial container as well as the use of chilled beams for heating and cooling.

1947



- *The Point Cloud*
- *Building Information Modeling and Data Management*

7. Building Information Modeling and Data Management



LIDAR Scan of Dentistry Pharmacy Building - Image is comprised of millions of laser generated points in space creating a "cloud" of measurable data.

BUILDING INFORMATION MODELING AND DATA MANAGEMENT

Overview

This project has been and will continue to be modeled in REVIT. The modeling is being done fully for all disciplines. Specific data related to the specification of materials, components and assemblies will be developed further throughout design development. These data will be used for the on-going maintenance of the building and will – through the use of the Stantec Asset Management System (SAMS) – be available for desktop and field display of all data associated with this project.

Model Development and Data Sources

The data streams will include:

- Embedded REVIT data.
- Use as maintained in the University's Facility Centre Trirega Database.
- Department allocations as maintained in the University's Facility Centre Trirega Database.
- RECAP information as specified by the University.
- GIS data layers as specified by the University and as developed by CloverPoint/ Stantec.

The data links have been established and will be made live prior to the FDC meeting in October.

"WeatherMap"

The use and department data provided by the link to Facility Centre will provide a live connection to the 3D display of uses and department allocations in the model of the Dentistry Pharmacy Building through the use of SAMS. This will also be true of the buildings from which the new occupants will be decanted. SAMS will allow 3D "weather mapping" across the various buildings contributing to the final occupancy of the Dentistry Pharmacy Building.

It should be noted that the University does NOT have Esri GIS datasets although they have an Esri license. Stantec/CloverPoint will populate layers as a starting point with what data is currently available. Terrain elevations will be derived from CAD information as well as a 2009 LIDAR scan done by the City of Edmonton.

The staged mapping will follow the anticipated timing of the various moves as the building redevelopment is completed consistent with the phasing plan described in this document. There may be a number of permutations possible as program requirements are reviewed and assessed.

Augmented Reality

The model of the building will be synchronized with an iPad image in the field to overlay the design shown here on the existing building picture as seen by the camera. This will be done "live" with the data streaming to the mobile device. Current work has the device application ready for field testing. This will enable people to walk through the building and view the proposed outcome in situ. We will supply 2 iPads to the university for this purpose.

Use of the Model at Later Stages

The preparation of the data formats at this early stage of project development will allow the University to integrate the information from a number of data sources for use in this building. The applicability of the SAMS System – utilizing InSight by CloverPoint – will allow the ongoing use across as many buildings and integrating as much data as the University wants to incorporate. This will allow easy desktop and field use (through mobile devices) of data related to the project including 3D, embedded data, O&M Manual information, use and department allocations and other information that the University might want incorporated.



A. Selective Demolition Plans

- Selective Demo Plans
- Scope

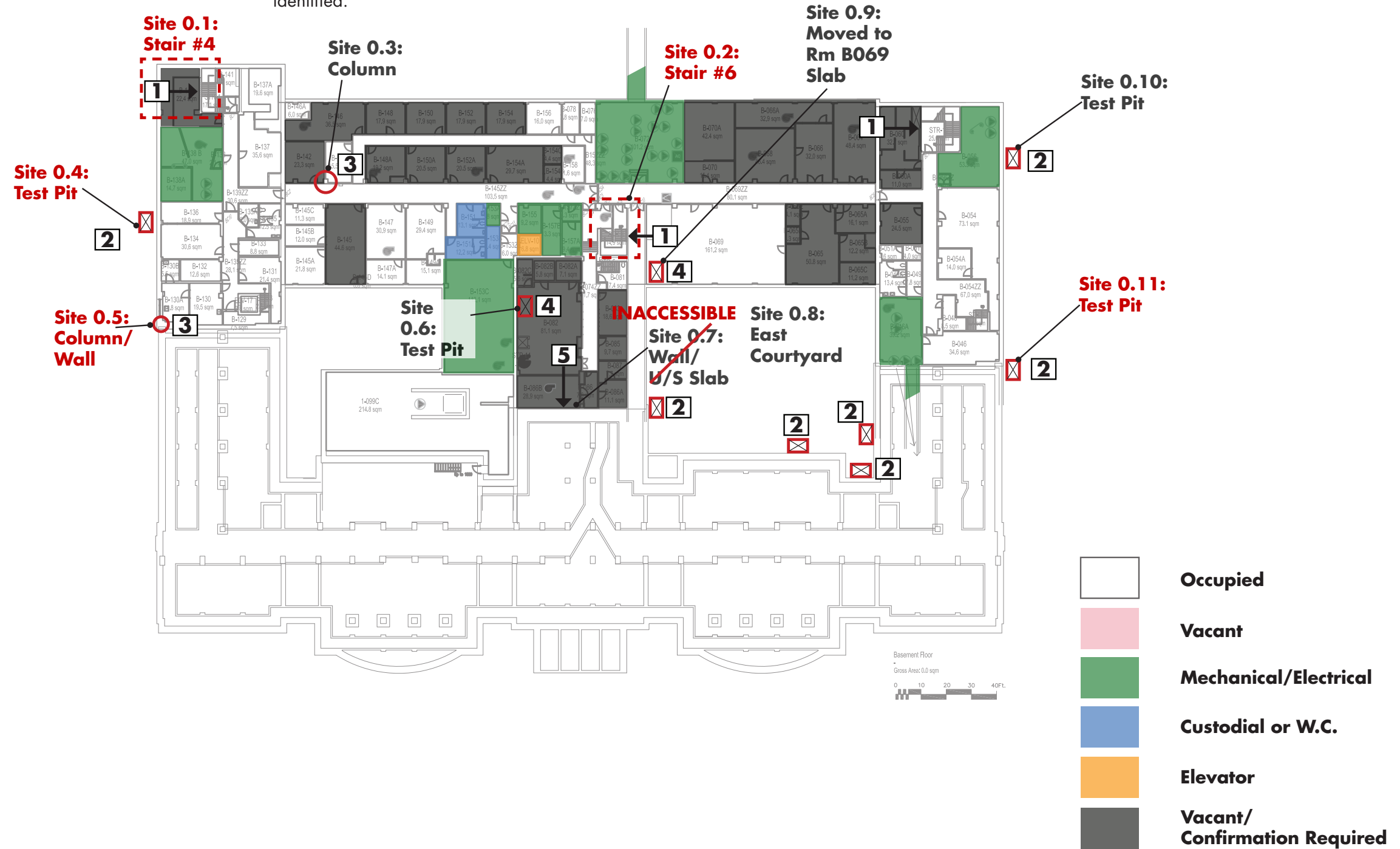
Basement

Selective Demolition:

Refer to notes on attached "Selective Demolition Outstanding Scope" document

General Notes:

- A. All selective demolition locations to be reviewed with design team to define exact scope and extent of demolition requirements.
- B. It is assumed that temporary removal of drop in ceiling tiles can be done as "non-destructive" inspection through-out the building in various locations to be identified.



A. Selective Demolition - Basement

Level 1

Selective Demolition:

Refer to notes on attached "Selective Demolition Outstanding Scope" document

General Notes:

A. All selective demolition locations to be reviewed with design team to define exact scope and extent of demolition requirements.

B. It is assumed that temporary removal of drop in ceiling tiles can be done as "non-destructive" inspection through-out the building in various locations to be identified.



A. Selective Demolition Plans

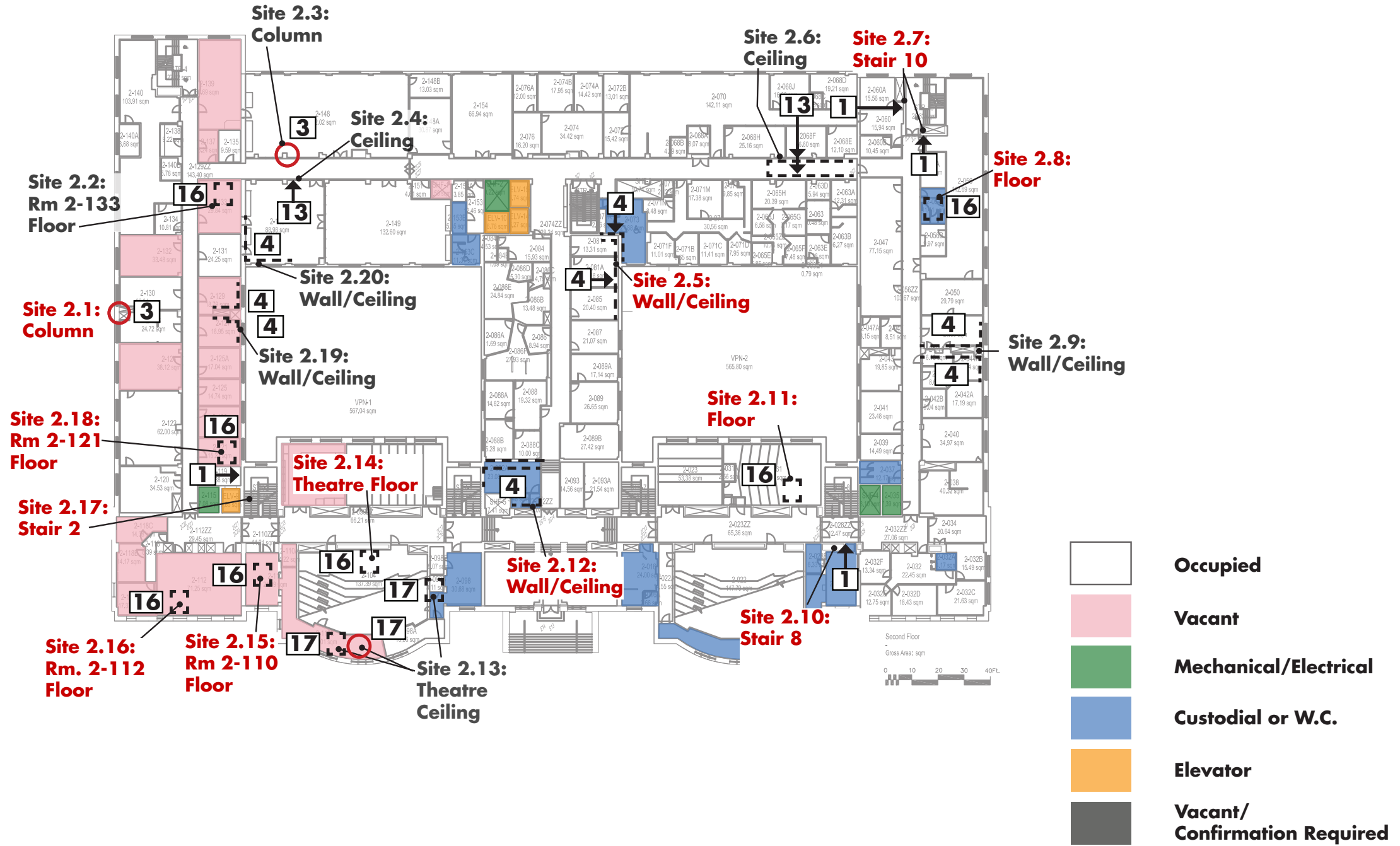
Level 2

Selective Demolition:

Refer to notes on attached "Selective Demolition Outstanding Scope" document

General Notes:

- A. All selective demolition locations to be reviewed with design team to define exact scope and extent of demolition requirements.
- B. It is assumed that temporary removal of drop in ceiling tiles can be done as "non-destructive" inspection through-out the building in various locations to be identified.



A. Selective Demolition - Level 2

Level 3

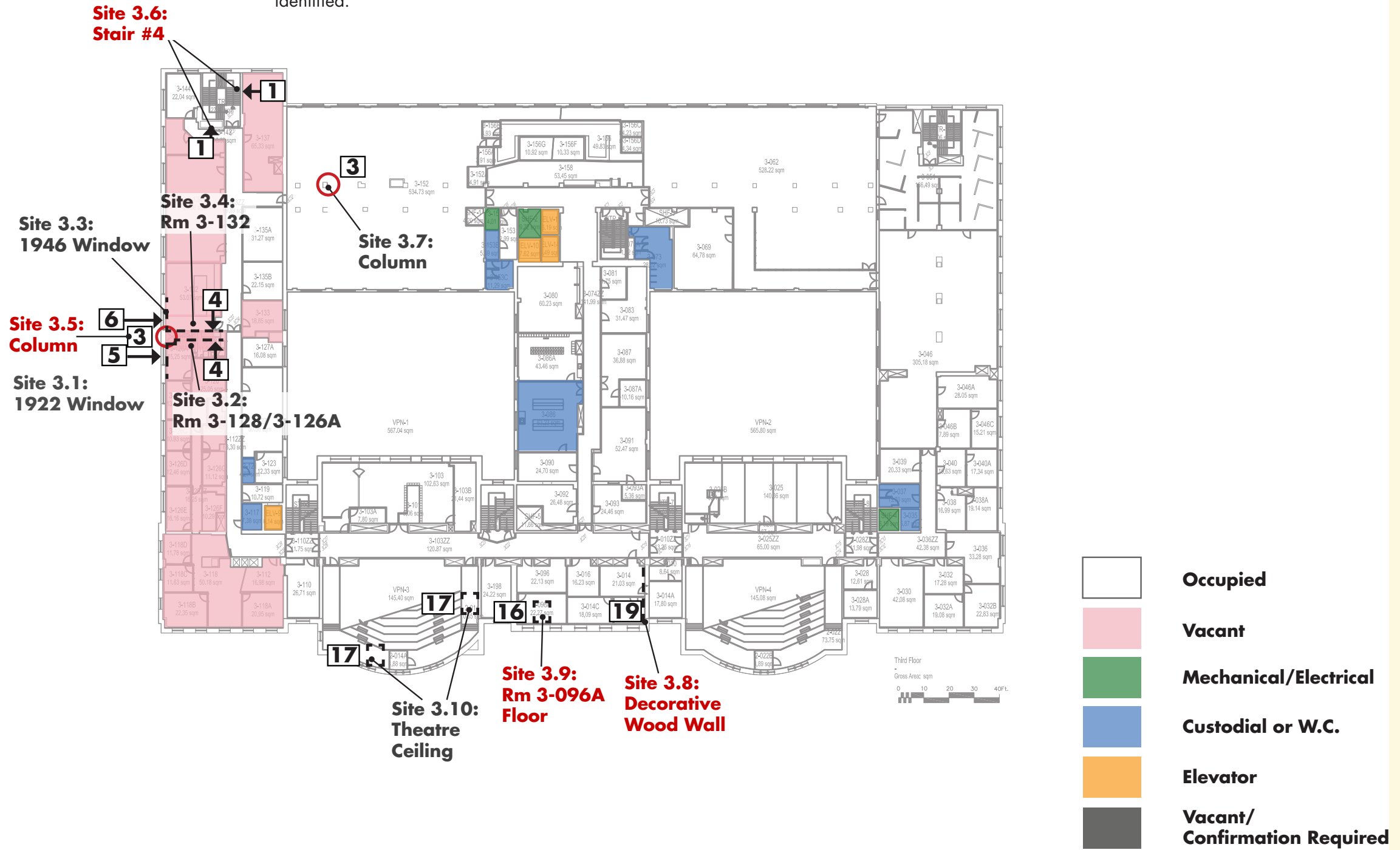
Selective Demolition:

Refer to notes on attached "Selective Demolition Outstanding Scope" document

General Notes:

A. All selective demolition locations to be reviewed with design team to define exact scope and extent of demolition requirements.

B. It is assumed that temporary removal of drop in ceiling tiles can be done as "non-destructive" inspection through-out the building in various locations to be identified.



A. Selective Demolition Plans

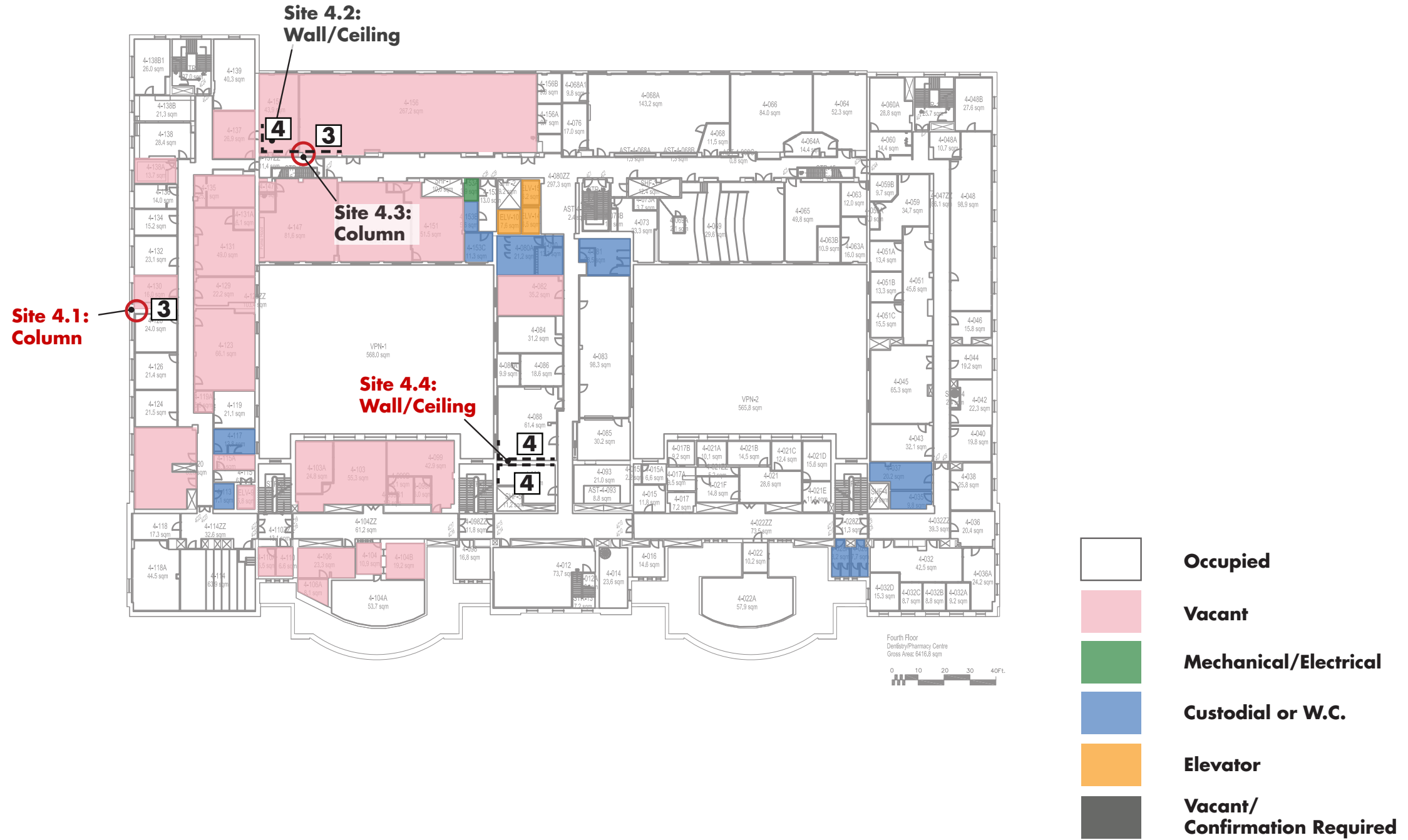
Level 4

Selective Demolition:

Refer to notes on attached "Selective Demolition Outstanding Scope" document

General Notes:

- A. All selective demolition locations to be reviewed with design team to define exact scope and extent of demolition requirements.
- B. It is assumed that temporary removal of drop in ceiling tiles can be done as "non-destructive" inspection through-out the building in various locations to be identified.



A. Selective Demolition - Level 4

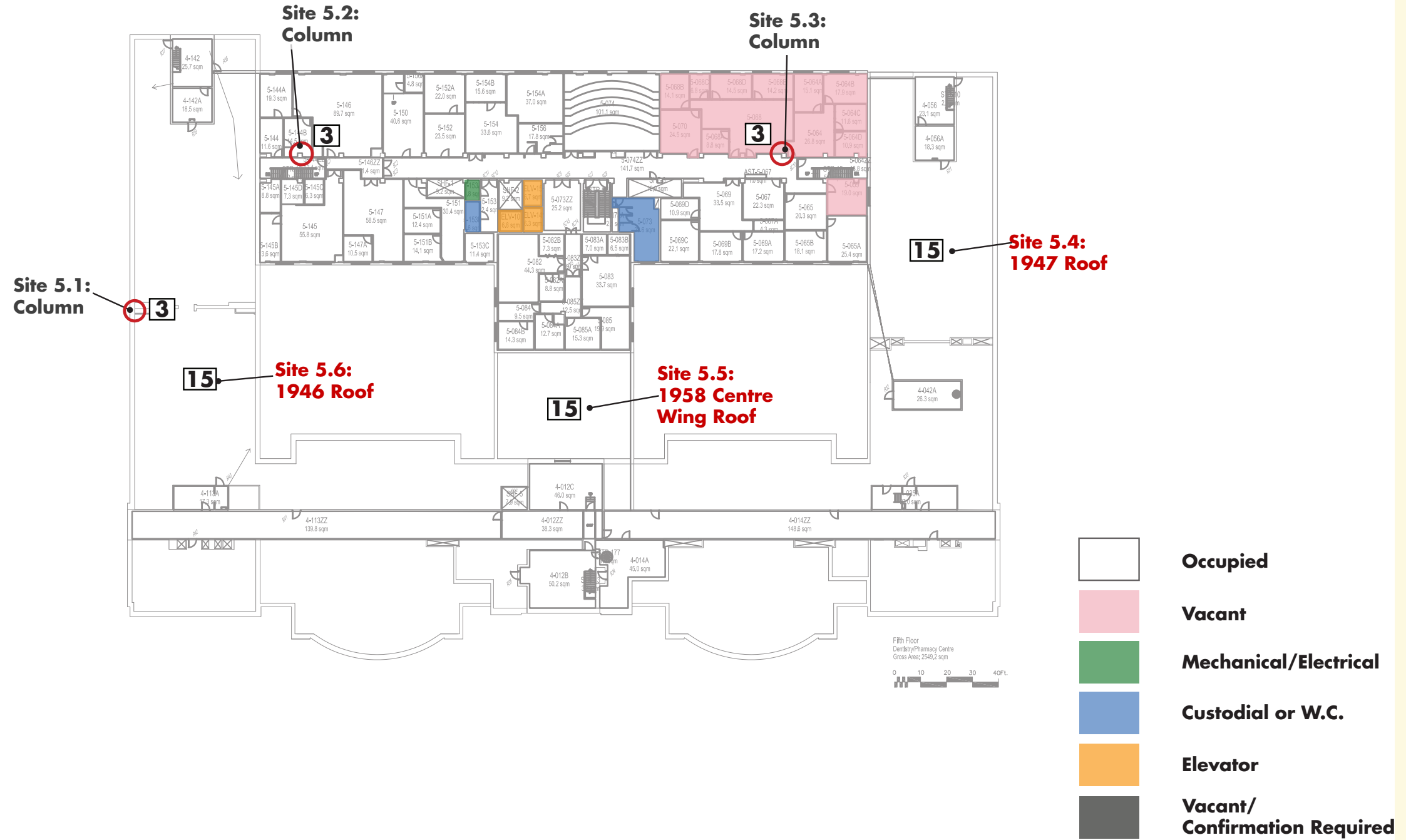
Level 5

Selective Demolition:

Refer to notes on attached "Selective Demolition Outstanding Scope" document

General Notes:

- A. All selective demolition locations to be reviewed with design team to define exact scope and extent of demolition requirements.
- B. It is assumed that temporary removal of drop in ceiling tiles can be done as "non-destructive" inspection through-out the building in various locations to be identified.



A. Selective Demolition Plans

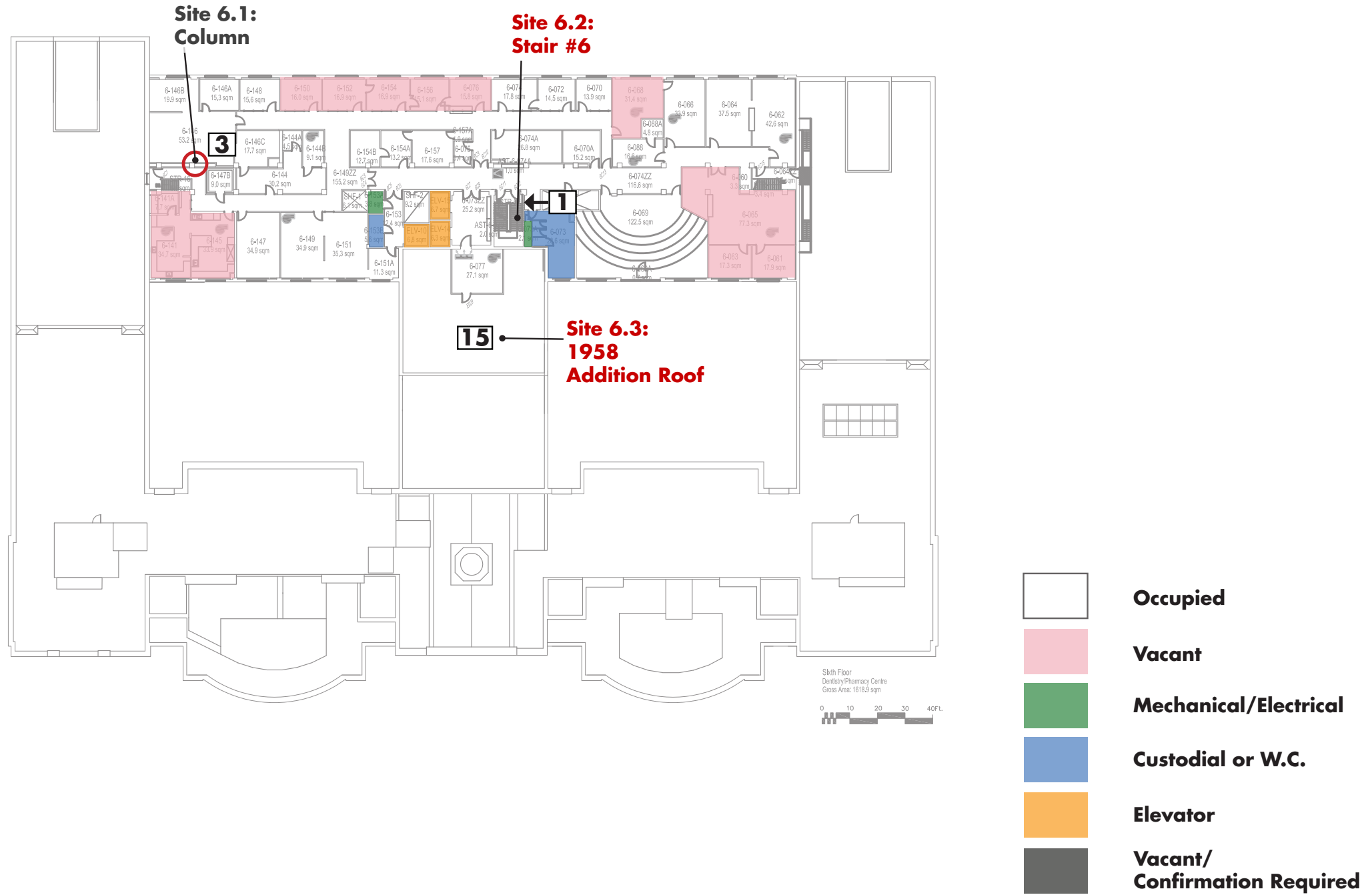
Level 6

Selective Demolition:

Refer to notes on attached "Selective Demolition Outstanding Scope" document

General Notes:

- A. All selective demolition locations to be reviewed with design team to define exact scope and extent of demolition requirements.
- B. It is assumed that temporary removal of drop in ceiling tiles can be done as "non-destructive" inspection through-out the building in various locations to be identified.



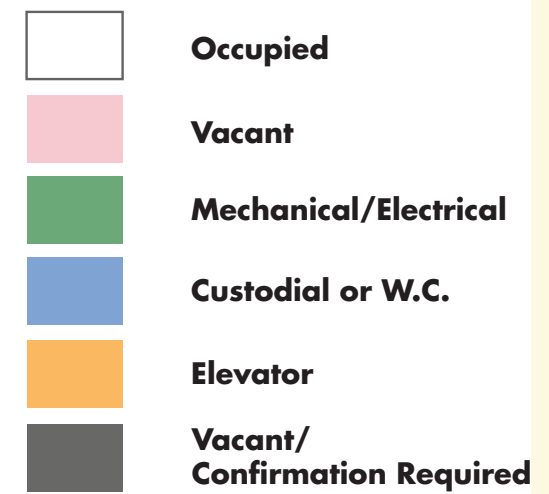
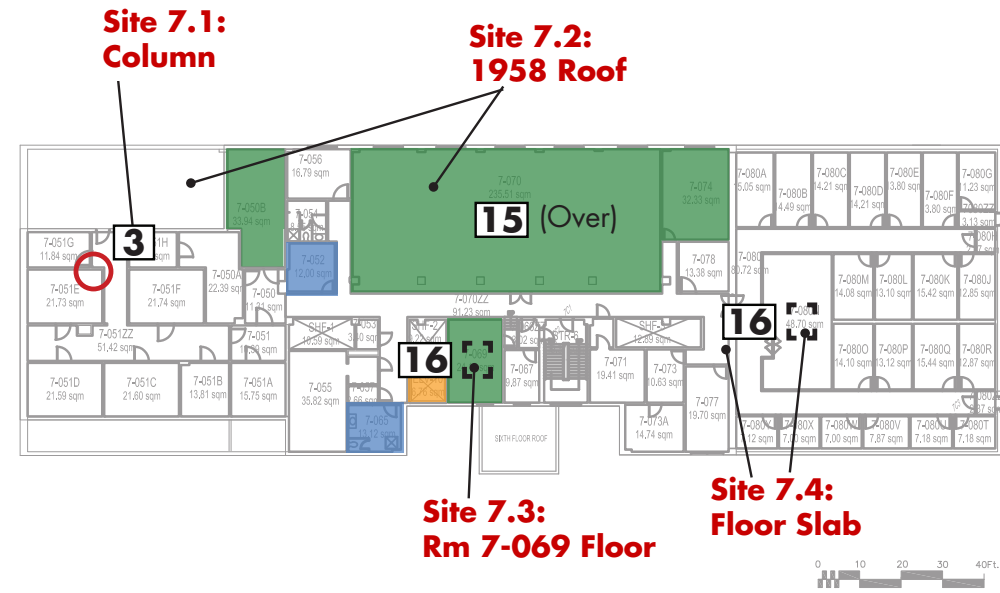
Level 7

Selective Demolition:

Refer to notes on attached "Selective Demolition Outstanding Scope" document

General Notes:

- A. All selective demolition locations to be reviewed with design team to define exact scope and extent of demolition requirements.
- B. It is assumed that temporary removal of drop in ceiling tiles can be done as "non-destructive" inspection through-out the building in various locations to be identified.



A. Selective Demolition Plans

Dentistry Pharmacy Building Redevelopment	
Selective Demolition Status Log	
Status Date:	
Site	Description of work required
Basement	
Site 0.1- Stair #4:	From room B-140 side expose stair structure at floor and at u/s of slab level to reveal stair structure and bracing in wall and its attachments at floor and ceiling.
Site 0.2 – Stair #7:	From either the corridor side or services tunnel side, expose stair structure at floor and ceiling similar to Site 0.1.
Site 0.3: Column	A column needs to be exposed at floor and ceiling (u/s of slab) at every level from basement to roof. Location is negotiable but needs to be in 1958 building.
Site 0.4: Exterior Test Pit	Dig test pit down to underside of existing footing to measure footing thickness and projection from foundation wall (width)
Site 0.5: Column/Wall	At the junction of the 1946 and 1922 buildings expose the column/wall from both sides from basement to roof.
Site 0.6: Interior Test Pit	Remove a portion of the floor slab and dig down to underside of footing to confirm depth and dimensions of the footing.
Site 0.7: Wall/U/S Slab	At ceiling level expose wall/floor slab junction on 1950s building side. [Complete?]
Site 0.8: East Courtyard	Dig test pits to underside of existing footing to establish depth and dimensions of footing – typical of 4 locations in East Courtyard.
Site 0.9: Rm B066 Floor Slab	Remove portion of floor slab and dig test pit to u/s of footing to establish depth and dimensions of footing.
Site 0.10: Test Pit	Dig test pit to u/s of footing to establish depth and dimensions of footing. Note: At this location some recent work was done (new gas line?)
Site 0.11: Test Pit	Dig test pit to u/s of footing to establish depth and dimensions of footing. Note: At this location some recent work was done (new gas line?)
Level 1	
Site 1.1: Column	See note for basement location Site 0.5.
Site 1.2: Column:	See note for basement location Site 0.3.
Site 1.3: Elevator Structure:	Remove portions of wall/ceiling finishes to expose elevator shaft structure.
Site 1.4: 1958 Window:	
Site 1.5: 1946-7/1922 Envelope/Window:	
Site 1.6: 1951/1958 Junction:	Remove portions of wall and ceiling finishes to reveal structural condition between these two buildings.
Site 1.7: West Courtyard:	
Site 1.8: Convect Cover:	Remove convect covers at several locations in the 1922, 1946, 1947 and 1958 buildings to confirm that plaster runs behind the convectors and that there is no additional insulation has been added. This can be accomplished by visual inspection by opening up an access panel on the convect cover.
Level 2	
Site 2.1 Column:	See note for Basement Level Site 0.5
Site 2.2 Rm 2-133 Floor:	Need to either core a hole through the floor slab to confirm thickness or expose a floor drain/service penetration through the slab to confirm slab thickness.
Site 2.3 Column:	See note for Basement Level Site 0.3
Site 2.4 Ceiling:	Need to remove ceiling finishes to expose structural condition of column/beam and floor slab above.
Site 2.5 Wall Ceiling:	Need to remove ceiling and/or wall finishes to reveal structural condition between the junction of the Centre and North wings of the 1958 building.
Site 2.6 Ceiling:	Need to remove ceiling finishes to expose structural condition of column/beam and floor slab above.
Site 2.7 Stair 10:	Need to remove wall and ceiling finishes to reveal structural connections of stair shaft – further on site direction required.
Site 2.8 Floor:	Need to either core a hole through the floor slab to confirm thickness or expose a floor drain/service penetration through the slab to confirm slab thickness.
Site 2.9a: Wall/Ceiling Rm 2-046:	Remove ceiling and/or wall finishes to reveal structural condition at 1947 and 1922 junction.
Site 2.9b: Wall/Ceiling Rm 2-044/2-044a:	Remove ceiling and/or wall finishes to reveal structural condition at 1947 and 1922 junction.
Site 2.10: Stair 8:	Remove ceiling and/or wall finish at stair shaft to expose structural conditions at wall/floor slab above.
Site 2.11: Floor:	The floor in this area is a tongue and groove wood plank sheathing. A portion of the floor needs to be removed to confirm construction and dimensions and to confirm if there is a return air opening beneath the floor connected to vertical risers in the corridor – confirmation of demolition location required with Architect on site.
Site 2.12: Wall/Ceiling: Rm 2-092A and B.	Remove ceiling and/or wall finishes to reveal structural condition between 1922 and 1958 buildings and between floor of 1922 and main corridor vertical masonry shafts.
Site 2.13: Theatre Ceiling:	
Site 2.14: Theatre Floor:	The floor in this area is a tongue and groove wood plank sheathing. A portion of the floor needs to be removed to confirm construction and dimensions and to confirm if there is a return air opening beneath the floor connected to vertical risers in the corridor – confirmation of demolition location required with Architect on site.

Site 2.15: Rm2-110 Floor:	The floor in this area is a tongue and groove wood plank sheathing. A portion of the floor needs to be removed to confirm construction and dimensions and to confirm if there is a return air opening beneath the floor connected to vertical risers in the corridor – confirmation of demolition location required with Architect on site.
Site 2.16: Rm 2-112 Floor:	The floor in this area is a tongue and groove wood plank sheathing. A portion of the floor needs to be removed to confirm construction and dimensions and to confirm if there is a return air opening beneath the floor connected to vertical risers in the corridor – confirmation of demolition location required with Architect on site.
Site 2.17: Stair 2:	Remove ceiling and/or wall finish at stair shaft to expose structural conditions at wall/floor slab above.
Site 2.18: Rm 2-121 Floor:	The floor in this area is a tongue and groove wood plank sheathing. A portion of the floor needs to be removed to confirm construction and dimensions and to confirm if there is a return air opening beneath the floor connected to vertical risers in the corridor – confirmation of demolition location required with Architect on site.
Site 2.19: Wall/Ceiling:	Remove ceiling and/or wall finishes to reveal structural condition at 1946 and 1922 junction.
Site 2:20: Wall/Ceiling: Rm 2-145 and Rm 2-121 and or Rm 2-133:	Remove ceiling and/or wall finishes to reveal structural condition at 1946 and 1958 junction.
Level 3	
Site 3.1: 1922 Window	
Site 3.2: Rm 3-128/3-126A:	Remove ceiling and/or wall finishes to reveal structural condition
Site 3.3: 1946 Window:	
Site 3.4: Rm 3-132:	Remove ceiling and/or wall finishes to reveal structural condition
Site 3.5: Column:	See basement Level notes in this similar location.
Site 3.6: Stair #4:	Remove ceiling and/or wall finish at stair shaft to expose structural conditions at wall/floor slab above.
Site 3.7: Column:	See basement Level notes in this similar location.
Site 3.8: Decorative Wood Wall:	Originally this suite of rooms was a single room called the Student Reading Lounge – the walls were finished with a decorative wood cladding. And the ceiling had a decorative plaster design. Portions of the replacement wall finish need to be removed delicately to confirm if the original wood paneling is still in place.
Site 3.9: Rm 3-096A Floor:	A coring is required through the slab to understand its thickness and composition. Alternately if there is a floor drain or other service penetration that can provide the required info without destructive measures that will also work
Site 3.10: Theatre Ceiling:	
Level 4	
Site 4.1: Column:	See basement Level notes in this similar location.
Site 4.2: Wall/Ceiling:	Remove ceiling and/or wall finishes to reveal structural condition
Site 4.3: Column:	See basement Level notes in this similar location.
Site 4.4: Wall/Ceiling:	Remove ceiling and/or wall finishes to reveal structural condition
Level 5	
Site 5.1: Column:	See basement Level notes in this similar location.
Site 5.2: Column:	See basement Level notes in this similar location.
Site 5.3: Column:	See basement Level notes in this similar location.
Site 5.4: 1947 Roof:	See "Roof Level" comments below.
Site 5.5: 1958 Centre Wing Roof:	See "Roof Level" comments below.
Site 5.6: 1946 Roof:	See "Roof Level" comments below.
Level 6	
Site 6.1: Column:	See basement Level notes in this similar location.
Site 6.2: Stair #6:	Remove ceiling and/or wall finish at stair shaft to expose structural conditions at wall/floor slab above.
Site 6.3: 1958 Addition Roof:	See "Roof Level" comments below.
Level 7	
Site 7.1:Column:	See basement Level notes in this similar location.
Site 7.2: 1958 Roof:	See "Roof Level" comments below.
Site 7.3: Rm 7-069 Floor Slab:	A coring is required through the slab to understand its thickness and composition. Alternately if there is a floor drain or other service penetration that can provide the required info without destructive measures that will also work
Site 7.4: Floor Slab:	The East and West ends of the 1958 North Wing have raised floor slabs. A coring is required through the slab to understand its thickness and composition. Alternately if there is a floor drain or other service penetration that can provide the required info without destructive measures that will also work.
Roof level	
General:	Roof cuts (12"x12") are required for all unique roof constructions (each building and additions) to understand insulation thicknesses and roofing assembly.

A. Selective Demolition - Scope

A. Selective Demolition Plans



- Building Envelope Report



Dentistry Pharmacy
Building Redevelopment
Building Envelope Report
Schematic Design DRAFT - September 11, 2012



Acknowledgements

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1. Introduction

1.1 Description of the “Buildings”

The original Dentistry Pharmacy building was constructed in 1922. It is designed in a neoclassical style complete with a central cupola. The building has four levels plus a penthouse and no basement. The exterior walls consist of solid clay brick masonry with Tyndall stone accent elements including belt courses, parapet caps and sills. Punched windows consist of wood framed vertical sliding units. The east and west wings were added in 1946 and 1947 and project a very similar exterior appearance. Both wings have four levels with a partial fifth floor and a partial basement. The taller seven storey centre wing was added in 1958 and varies in that a brick veneer with a block backup wall forms the exterior wall. Over the ninety years since original construction numerous renovations have been carried out and several smaller additions were added to the overall building.

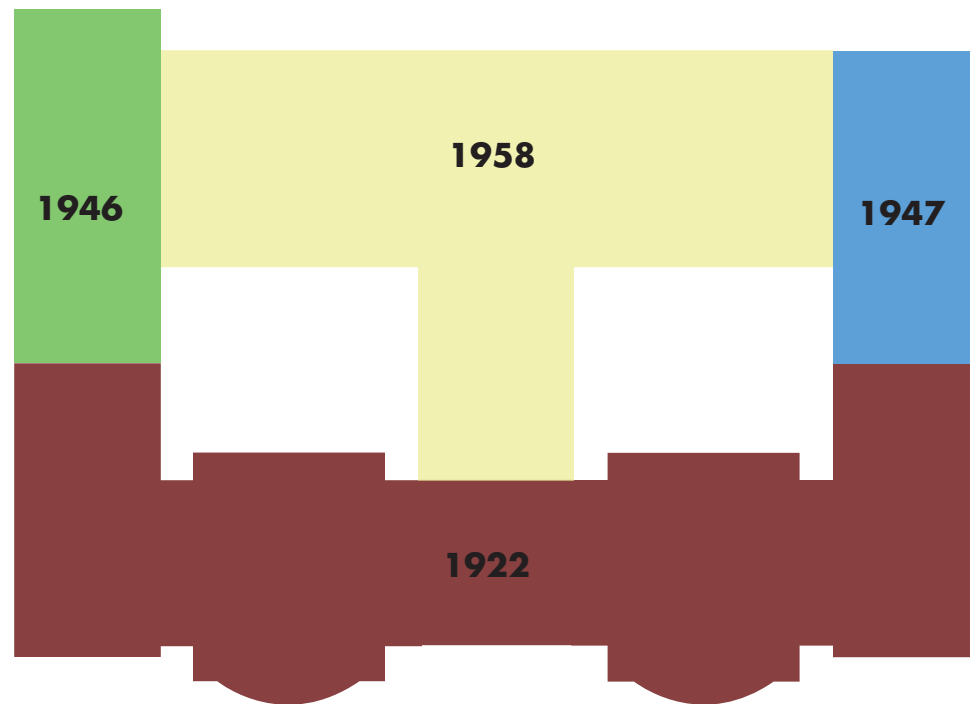


Figure 1 - Dentistry Pharmacy Building Keyplan

1.2 Terms of Reference

As part of the Schematic Design phase of the building redevelopment an overall assessment and analysis of the building envelope is required and BVDA Façade Engineering, as part of the project team, participated in this task. The scope of services to be provided are summarized below.

1. Conduct a review of available building drawings and any previous reports in order to develop some familiarity with the cladding systems, identify potential weaknesses and properly develop an assessment programme.
2. Conduct a reasonably thorough review of the building on the interior and from grade and roof level on the exterior to confirm the previous assessments and develop an opinion as to the overall condition of the building envelope.
3. Conduct specific investigations to examine windows, walls, doors, and attic areas to gather information necessary to assess current condition, historic performance, evaluate hygrothermal performance and to develop an overall understanding of the functioning of the building from a building physics perspective.
4. Liaise with the mechanical engineers to develop an understanding of the current HVAC system and any proposed systems from the perspective of how they impact the building fabric.
5. Prepare a draft report for review documenting our procedures, observations, comments and recommendations. Recommendations may include renovation or upgrading of specific elements.

1.2.1 Reference Documents

Reference documents relied on in this study included:

- Dentistry Pharmacy Building Condition Report 110926
- University of Alberta RFP 2011-0147 Redevelopment of Dentistry Pharmacy Building
- Concept Design Report 2011 03 10.
- Original Nobbs and Hyde Drawings of the 1922 building
- Original Rule Wynn Rule Drawings of the 1946/47 Wings
- Original Department of Public Works Drawings of the 1958 “Centre Wing”

2. Examination of Existing Conditions

2.1 Document Review

The two documents relied on for reference information included the Concept Design Report of 2010 and the Building Condition Report of 2011. Review of these reports provided a general overview of the construction and condition of the buildings useful to the current study.

It should be noted that on site review through the selective demolition process has revealed as-built conditions different than those outlined in these previous reports.

2.1.1 Concept Design Report

This report documents the history of the buildings and the design concepts for the redevelopment of the building but also provides useful information on the buildings construction and condition.

- The exterior cladding consists of solid red brick masonry with raked joints and tyndall stone accent. There is a stone banding at the base of the building. All additions include the same red brick. The building was cleaned and repointed in 1998-99. The typical wall assembly, from interior to exterior, of the 1922 and 1947/48 components consists of :

Paint
Plaster
Clay tile (not all locations)
Brick (2 or 3 wythes) or stone depending on location

The typical wall assembly of the 1958 addition consists of:

Paint
Plaster
Clay tile (75mm)
Air space (12mm)
Brick (200mm) or stone depending on location

Or

Paint
Plaster (20mm)
Cork (40mm) at heating cabinets
Brick

- There are glass block panels at the stairwells on the north elevation. There are several stone feature elements in the facades including cornices, keystones, and window sills.
- The majority of the windows are double or single hung units with wood frames incorporating sealed double glazed units. There is a combination of wood frame and aluminum vertical sliding and fixed sealed units that were installed in 1977.

- There is a ridge skylight that appears to be original to the 1922 building. The metal framed skylight is glazed with Georgian wired glass.
- The roofs are primarily flat with a conventional built-up roof membrane system replaced between 1996 and 2000. The roof assembly is on a 4" thick lightweight concrete slab.
- The exterior main entrance doors are solid wood with a stain finish.

2.1.2 Dentistry Pharmacy Centre Building Condition Report 110926

This report documents a high level review of the buildings condition with little or no analysis. Observations of significance include the following:

- The overall building structure and exterior envelope are in generally acceptable condition.
- The exterior walls consist primarily of solid brick and composite masonry assemblies with raked joints. Exterior block walls on the centre wing are painted.
- Tyndall stone accents and banding are used throughout. Glass block accents are also used.
- Windows are single and double hung wood framed vertical sliders with insulating glass units. Doors are solid wood framed.
- Flat roofs consist of conventional BUR systems renewed between 1996 and 2000. The roofing is nominally insulated on a 4" lightweight concrete slab.
- Steel framed skylights incorporating Georgian wired glass are located on the east wing.

2.2 Enclosure Review Methodology

The on site visual reviews were conducted by Mr. Mark Brook, P. Eng. on various dates between December 2011 and July 2012. Further on site review was carried out by various Stantec staff including Mr. Jason Lowe over the same time period. In addition to visual review some limited intrusive examination, involving removal of local areas of brick and selected windows, was carried out by Stantec staff and a contractor provided by the University as documented below. The intent of the site review was to confirm previously reported observations and to identify any missing information critical to the decision making process.



Figure 3 - 1922/1946 Window Investigation Locations (West Elevation)



Figure 2 - 1922 Selective Demolition - West Facade



Figure 4 - 1958 Window Investigation Location (North Elevation)

2.3 Building Review

As noted elements of the building envelope have been built at different times using slightly varying techniques. Observations were made and grouped according to location and system such as walls, windows and doors and attic and roof.

2.3.1 Above Grade Walls

The details of the above grade walls were viewed from the exterior at grade level and from the roof and on the interior at isolated locations on various floor levels and from accessible attic spaces. With some exceptions the general configuration of the walls is consistent with the observations in the previous reports. Notwithstanding significant areas of poor mortar jointing, the masonry is in generally good condition. Isolated areas of stone distress and mortar erosion were noted. No significant spalling or fracturing consistent with freeze thaw deterioration was noted.



Figure 5 - Existing Brick Masonry Types/Condition

The wall cross section in the 1922/46/47 blocks was confirmed in the window test opening programme (see below) and consists from inside to out of painted plaster and lath on multiple wythes of clay brick with brick or stone facing. No plaster was noted above the ceiling levels. Site review at exposed conditions on the interior revealed no insulation at the exterior walls.

While the 1958 addition generally matches with respect to brick colour the brick texture and joint pattern varies and shelf angles consistent with a cavity wall are visible. Joints are raked and in generally better condition than the other earlier wall areas. The wall cross section was confirmed in the window test opening programme (see below) and consists from inside to out of painted plaster, concrete block, air void and clay face brick.

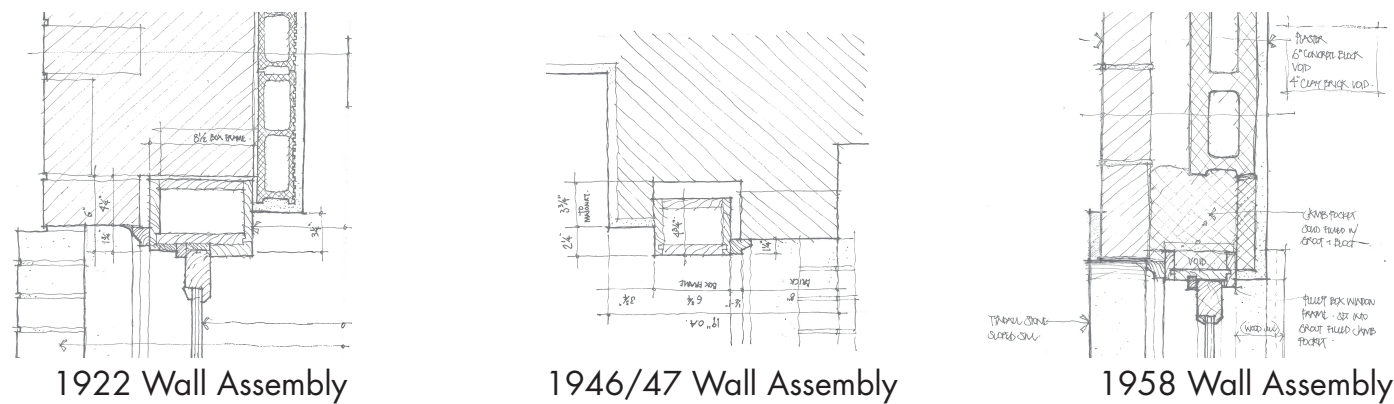


Figure 6 - Existing Wall Assemblies

Tyndall Stone Parapet Caps

Tyndall Stone carving bosses - left un-carved (this one intended as building signage)

Brick masonry returns

Tyndall Stone Sills

Decorative Tyndall Stone keystones and entablatures

Wood frame double and single hung windows with sealed insulating glazing units

Clay Brick Masonry with raked mortar joints

Tyndall Stone Belt Course

Tyndall Stone Plinth

Granite Base



Figure 7 - 1922 Wall "Anatomy"

Tyndall Stone Parapet Caps

Tyndall Stone banding

Tyndall Stone string course sill

Decorative Tyndall Stone keystones/arches

Brick masonry returns

Brick Masonry Sills

Brick masonry flat arches supported on steel lintel angles

Wood frame double and single hung windows with sealed insulating glazing units

Tyndall Stone Belt Course

Clay Brick Masonry with raked mortar joints

Granite Base



Figure 8 - 1946 Wall "Anatomy" (1947 Similar)

Painted concrete block
Prefinished Metal or aluminum parapet caps

Tyndall Stone banding

Tyndall Stone string course sills

No masonry arches over windows, running bond supported on steel shelf angle.

Wood frame double and single hung windows with sealed insulating glazing units

Clay Brick Masonry with raked mortar joints

Tyndall Stone Panel Band

Granite Base



Figure 9 - 1958 Wall "Anatomy"

2. Examination of Existing Conditions

2.3.2 Windows and Doors

As the intent is to replace the existing windows a detailed survey was not conducted. However further information regarding the perimeter conditions at the windows is important as it relates to the window replacement design. As such window glazing and portions of window frames were removed at three locations to sample the construction in the 1922, 1946 and 1958 buildings. In all cases the frame assembly was removed to expose the masonry at the rough opening at the sill, jamb and head. Full details of this investigation as documented by Jason Lowe are included in the following pages.

The main entry doors are solid stained wood and in condition suitable for refurbishing.



Figure 10 - 1946 - North-West Stair Entrance



Figure 11 - 1947 - East Entrance



Figure 12 - 1922 - Main South Entrance

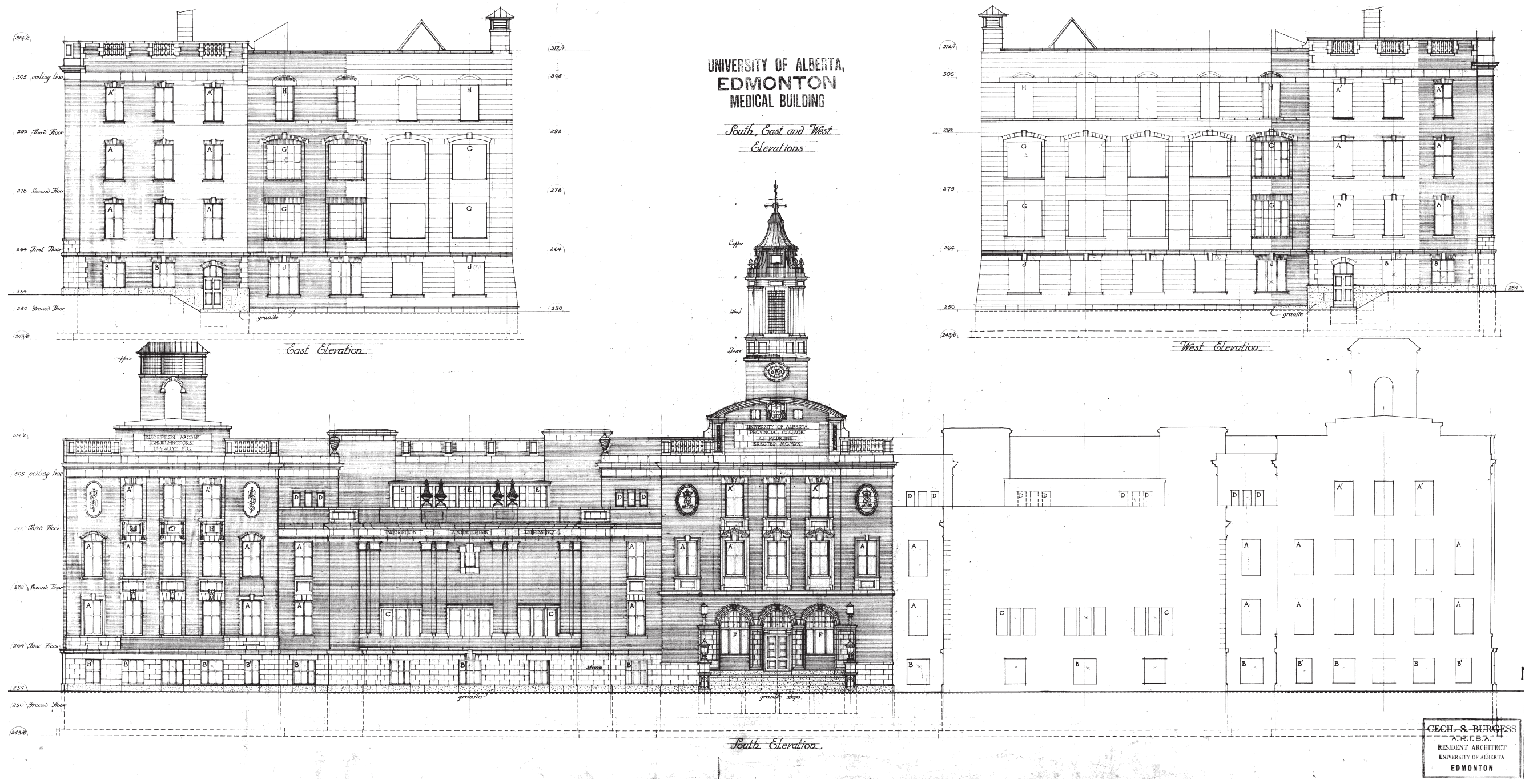
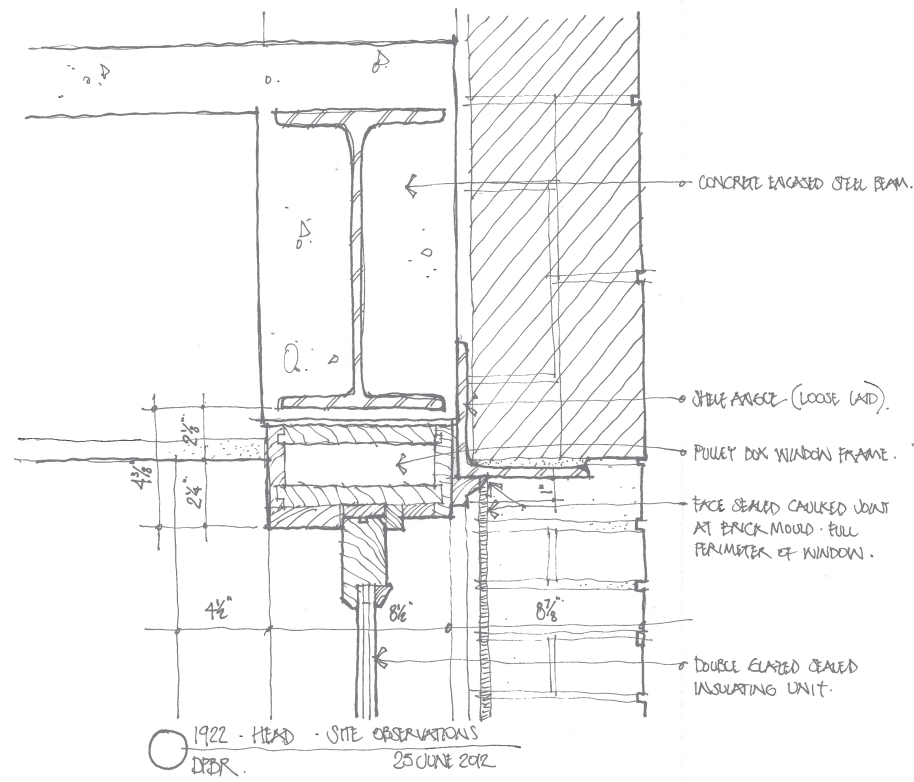


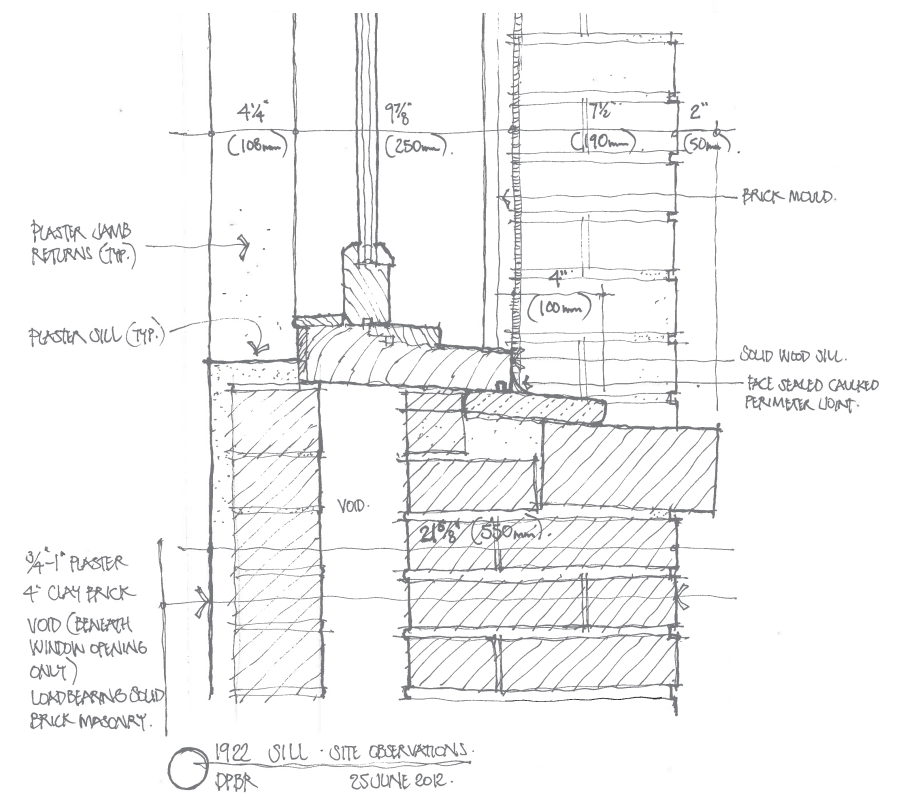
Figure 13 - 1922 Original Building Elevations



- Brick Masonry Flat Arch
- 6"x6" Steel Lintel Angle
- Concrete clad steel beam
(In some locations concrete fireproofing cover is missing)
- Pulley Box Frame



Figure 15 - 1922 Window - Head



- Brick Masonry Sill Course
- Pre-cast or Stone Sill "Flashing"
- Wood Sill
- Pulley Box Frame
- Solid Brick Masonry
- Masonry Void beneath window sill at window locations only
- Masonry lip supporting window frame
- Plaster sill/jamb returns on brick masonry
- Fintube cabinet



Figure 16 - 1922 Window - Jamb looking at Sill

Figure 14 - 1922 Window - Sketch Detail - Head and Sill - Section



Figure 17 - 1922 Level 1 Window Detail - Sill

- Brick masonry flat arch
- Steel shelf angle
- Steel beam. Bottom flange is partially exposed and strands of the steel wire reinforcing are visible that hold concrete fire proofing to steel.
- Solid Brick Masonry wall
- Wood pulley box frame
- Plaster wall finish
- "Face Sealed" caulked joint at brick mould/brick jamb joint
- Brick Masonry Jamb return



Figure 18 - 1922 Window - Level 2 Head

- Solid Wood Window Frame Sill (Note water penetration full depth of sill frame)
- Brick Masonry
- Masonry Void (below sill only)
- Plaster Sill on terra cotta masonry block "furring")
- Fintube enclosure cabinet
- Brick Masonry sloped sill



Figure 19 - 1922 Window - Level 2 Sill

2.3 Building Review - 1922 Windows

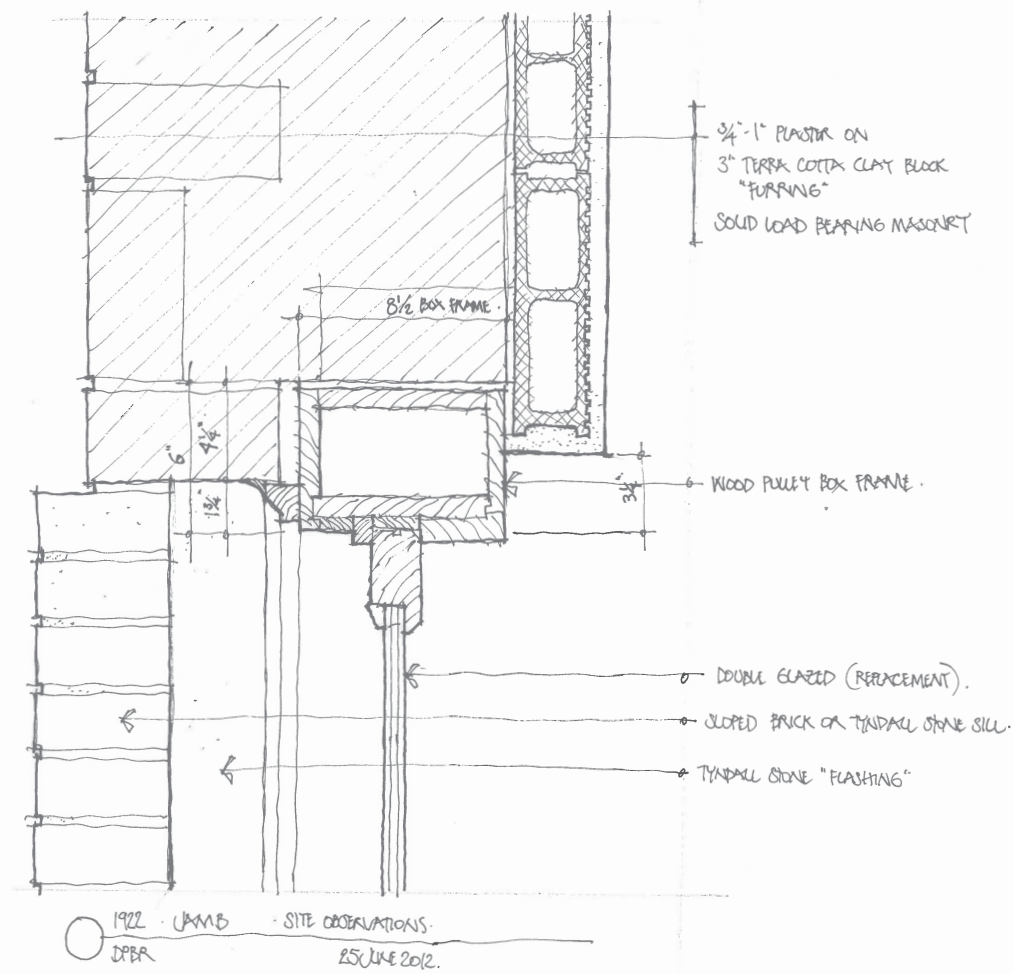


Figure 20 - 1922 Window - Sketch Detail - Jamb

Pulley Box frame

Solid Brick Masonry

Painted Plaster on brick masonry



Figure 21 - 1922 Window - Jamb looking at Head

Pulley Box frame

Face sealed full perimeter
caulked joint

Solid Brick Masonry

Painted Plaster on terra cotta
clay "furring"



Figure 22 - 1922 Window - Jamb

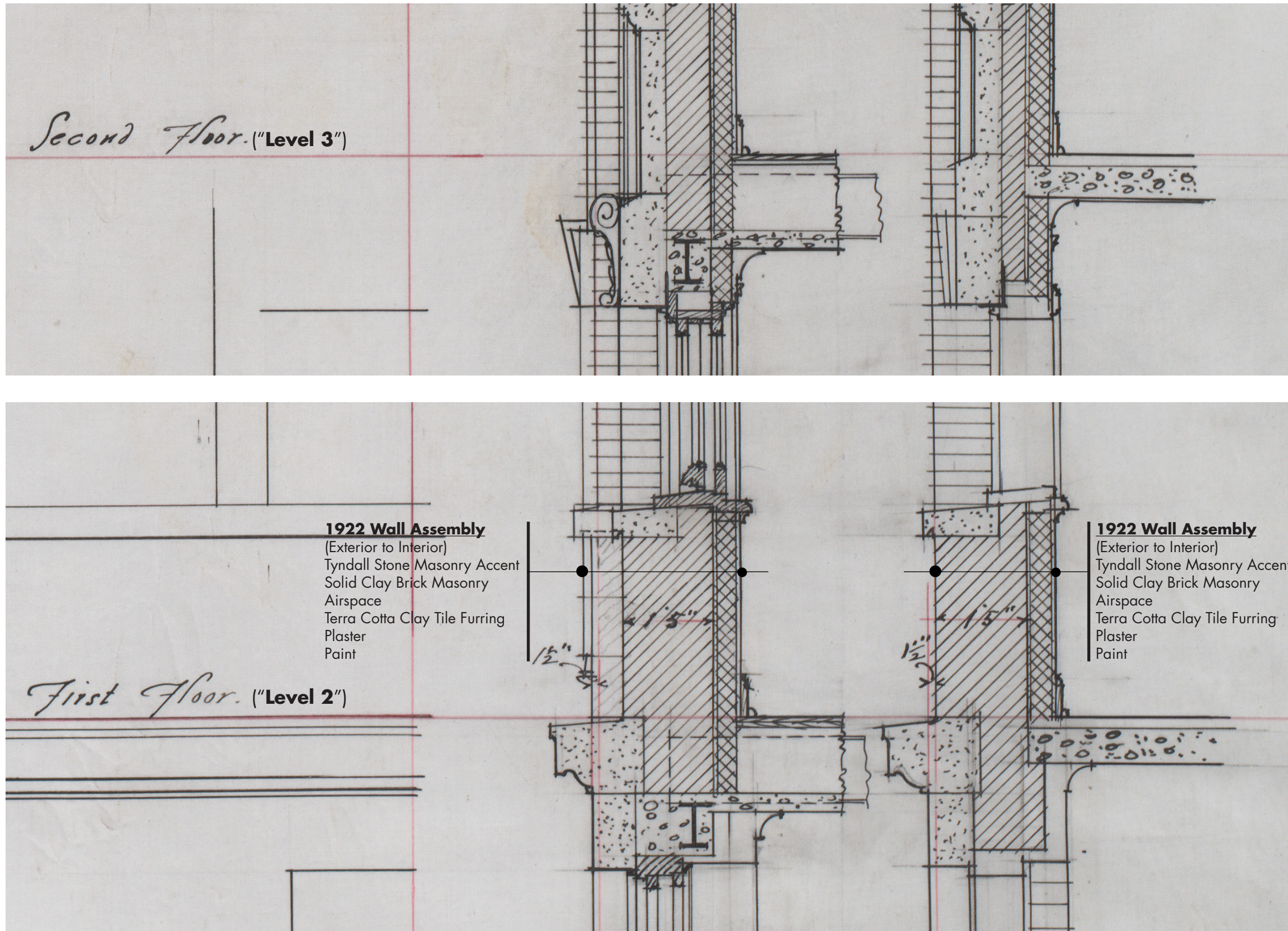


Figure 23 - 1922 Window - Original Window Sections

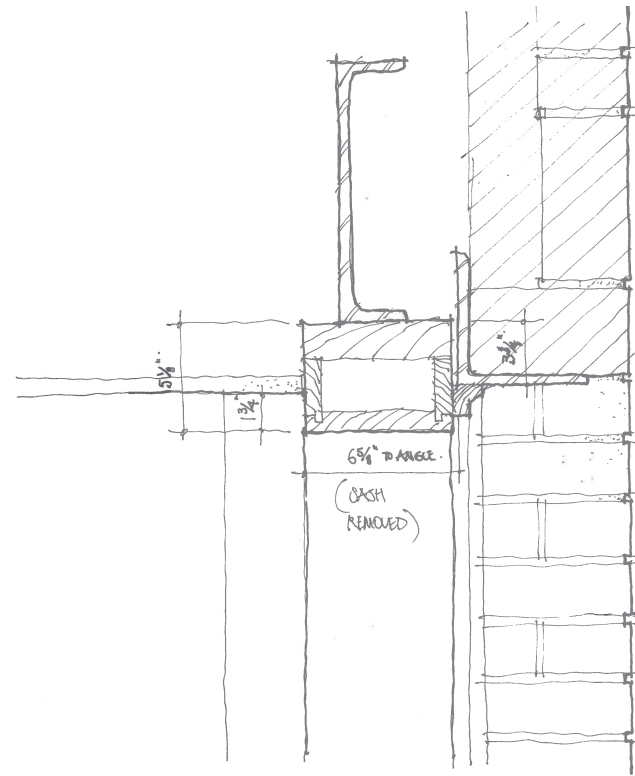
2.3 Building Review - 1922 Windows



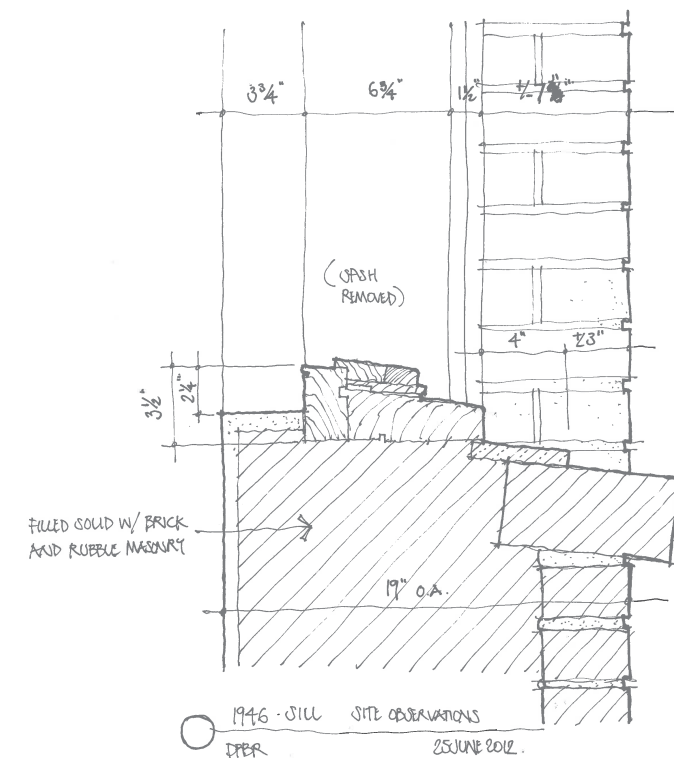
Figure 24 - 1946 Windows - North Elevation West Wing



Figure 25 - 1946 Windows - West Elevation West Wing



1946 HEAD - SITE OBSERVATIONS
DPR 25 JUNE 2012



1946 - SILL - SITE OBSERVATIONS
DPR 25 JUNE 2012

Figure 26 - 1946 Window - Sketch Detail - Head and Sill

6"x6" Steel Lintel Angle

Rough buck framing above window frame

Plaster finish

Brick Masonry

Pulley Box Frame



Figure 27 - 1946 Window - Head

Solid Wood Window Frame Sill

Masonry Void

Brick Masonry

Plaster Sill

Fintube enclosure cabinet



Figure 28 - 1946 Window - Sill

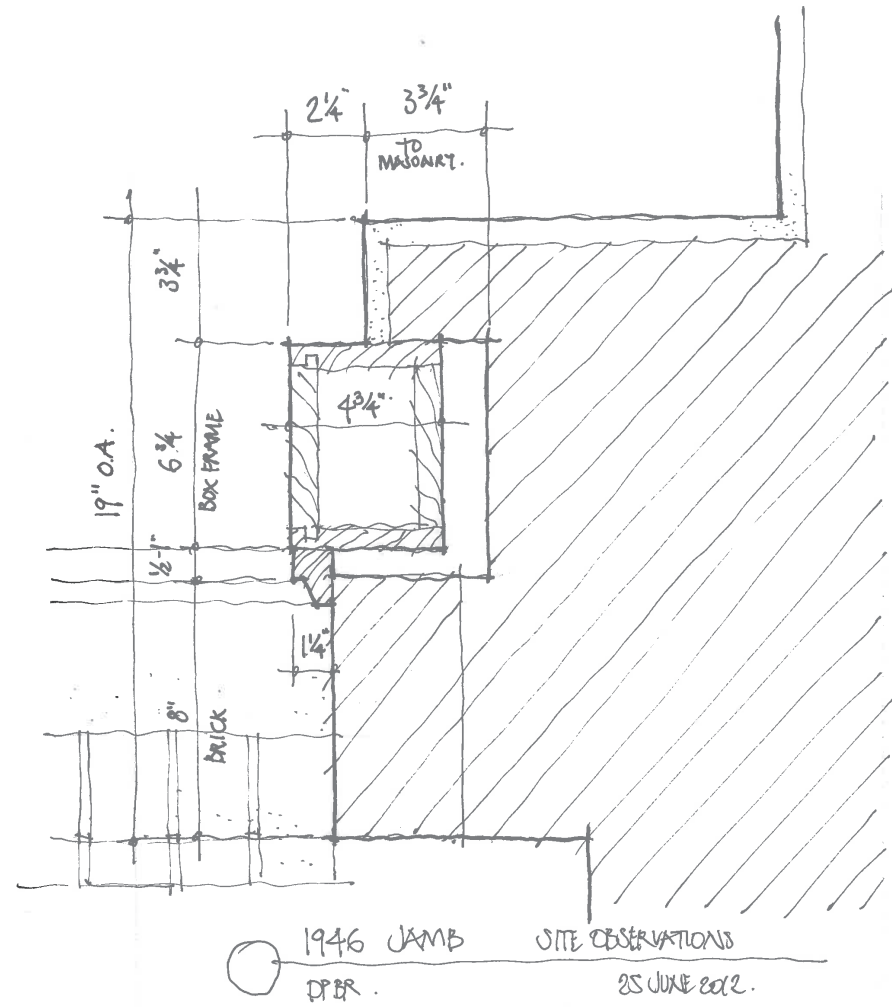


Figure 29 - 1946 Window - Sketch Detail - Jamb



- Pulley Box Frame
- Solid Brick Masonry
- Plaster finish on brick masonry
- Post demolition void to be filled in new work

Figure 30 - 1946 Window - Jamb - Pully box frame looking up at Head



- Pulley Box frame
- Solid Brick Masonry
- Painted Plaster on brick masonry

Figure 31 - 1946 Window
Jamb exposed at Sill



1946 Selective Demolition Site

Figure 32 - 1946 Window - Head



Window box frame

Window box frame "pocket"

Tyndall Stone Sill Flashing

Figure 33 - 1946 Window - Head



Figure 34 - 1946 Window Exterior Sill Condition



1946 Selective Demolition Site

Figure 36 - 1946 Window - Sill



Window box frame "pocket"

Plaster returns - typical

Tyndall Stone Sill Flashing

Figure 35 - 1946 Window - Sill at Jamb - exposed

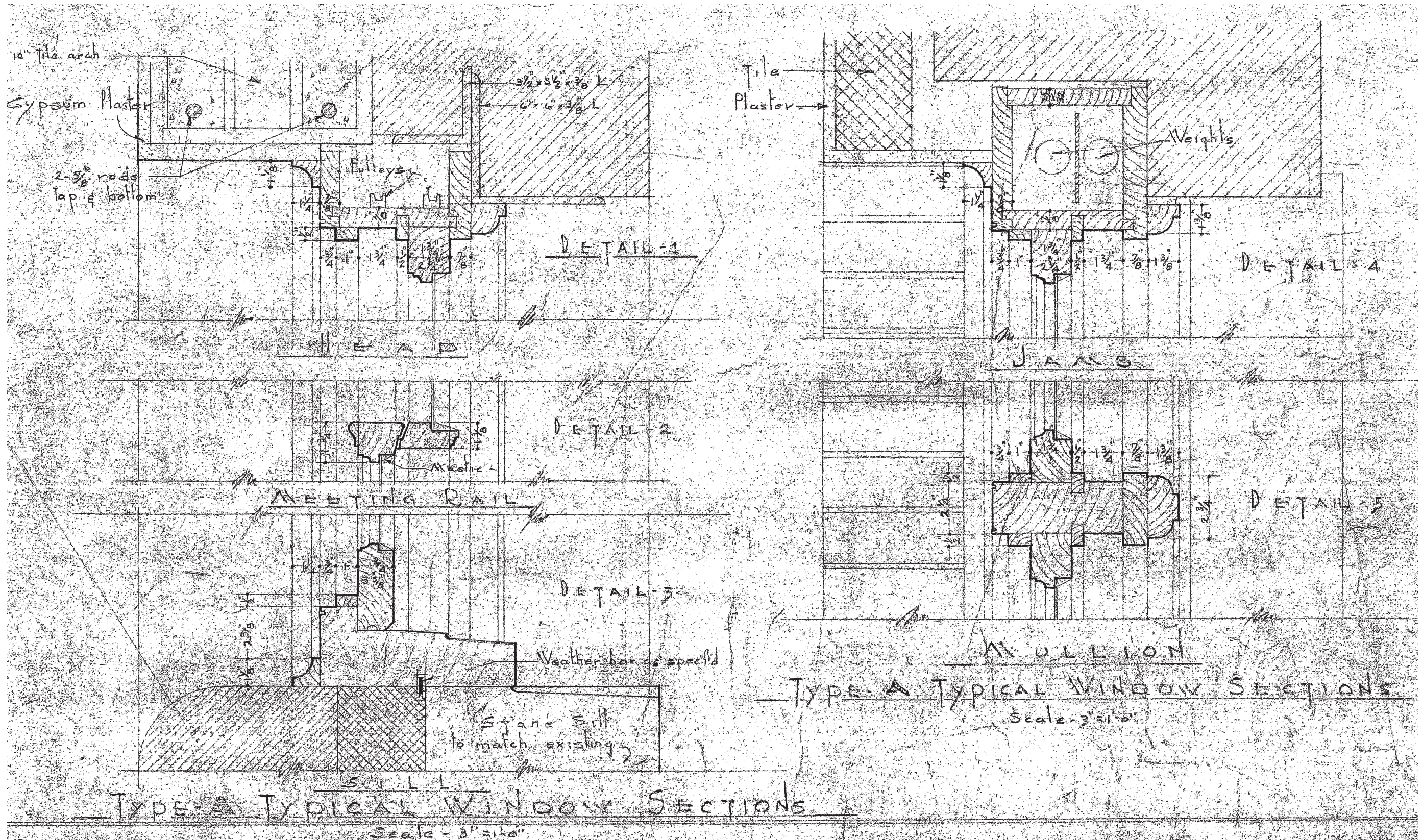


Figure 37 - 1946 Window - Original Drawings - Section Details

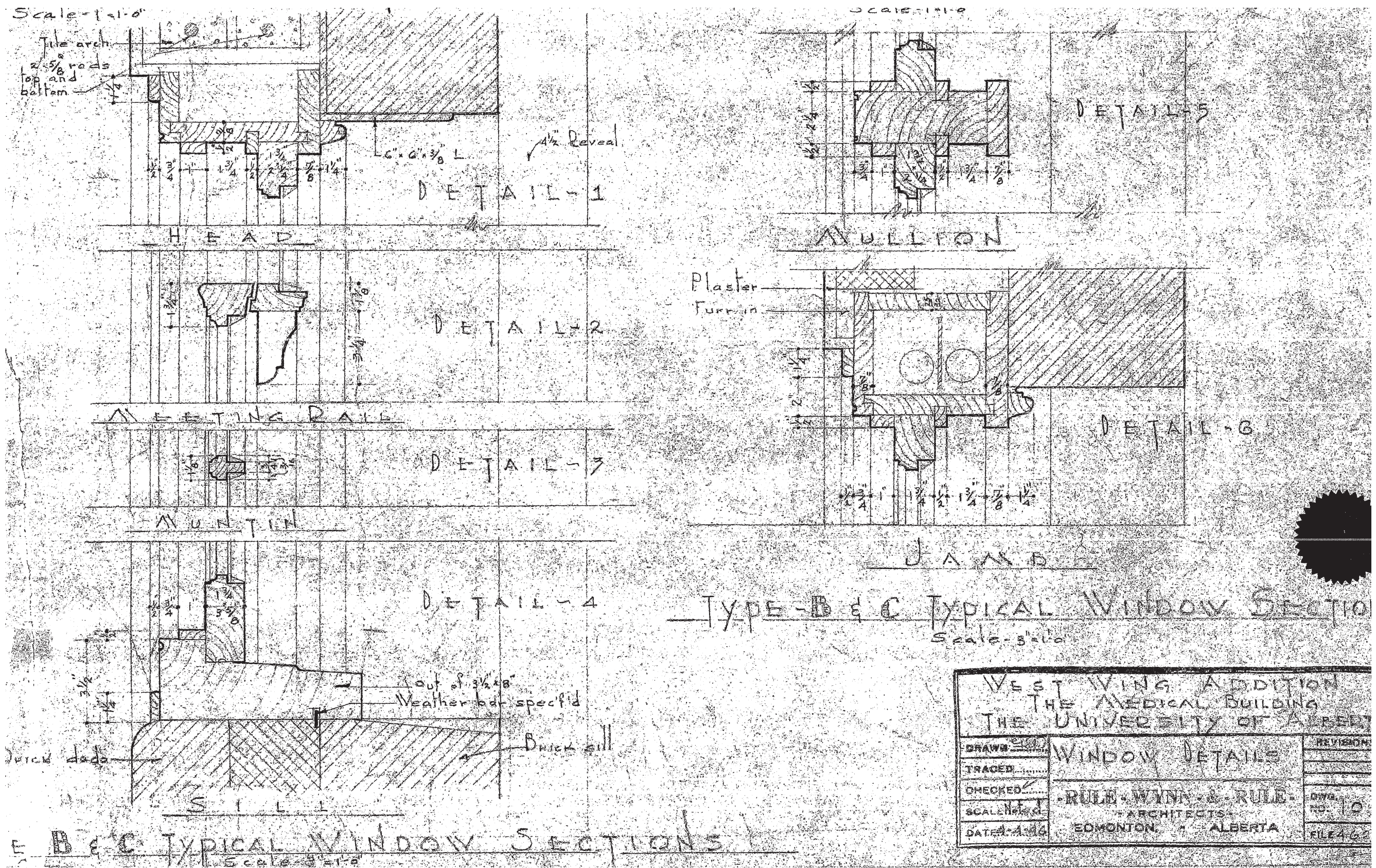


Figure 38 - 1946 Window - Original Drawings - Section Details

2.3 Building Review - 1946/47 Windows

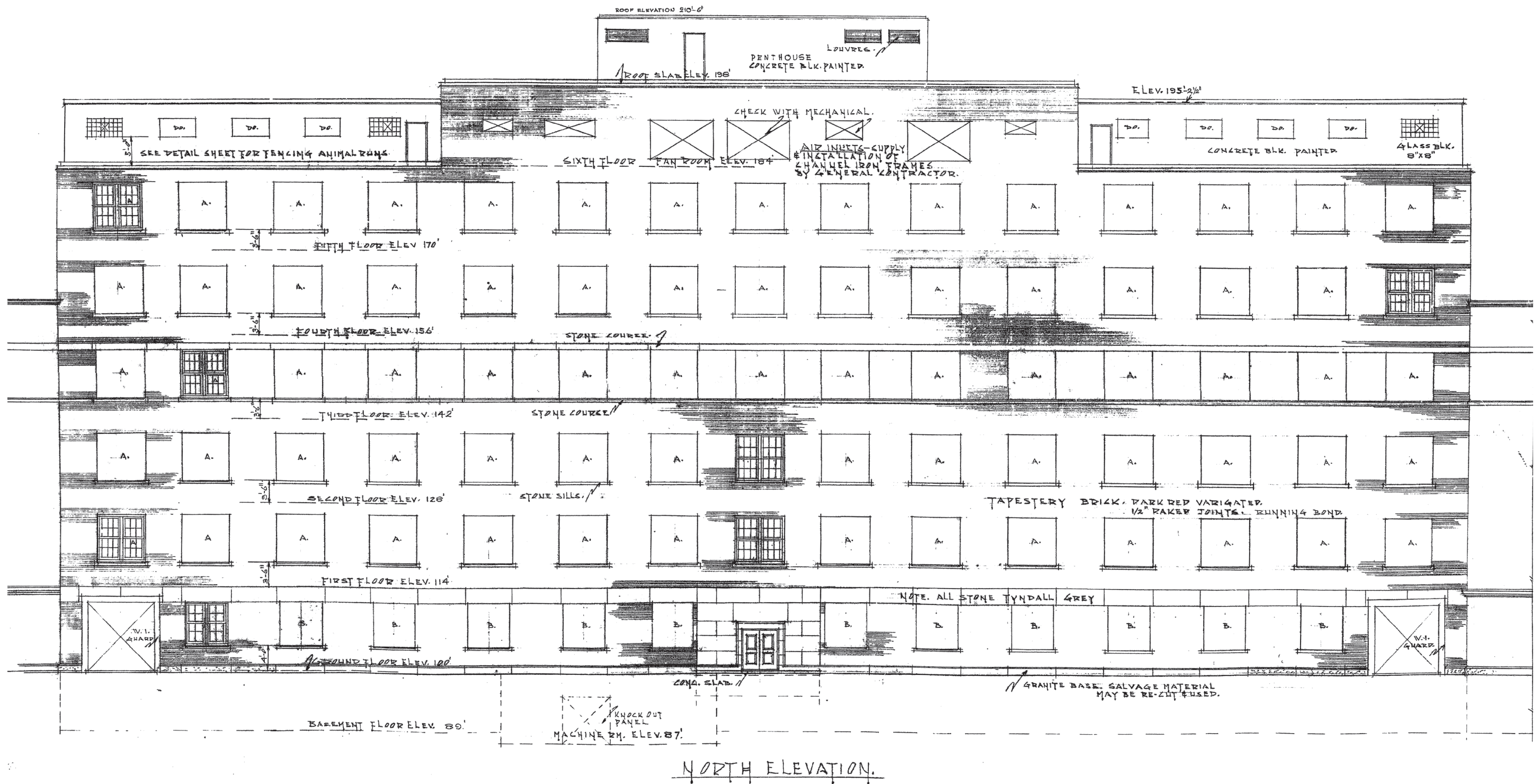


Figure 39 - 1958 North Elevation



Figure 40 - 1958 View of North Facade from Triffo Hall

2.3 Building Review - 1958 Building - North Elevation (Partial)



Figure 41 - 1958 Window - Level 1 Elevation



Figure 42 - 1958 Window - Level 1 Elevation



Tyndall Stone Band
Shelf Angle

Figure 43 - 1958 Window - Head



Figure 47 - 1958 Window - Sill Elevation

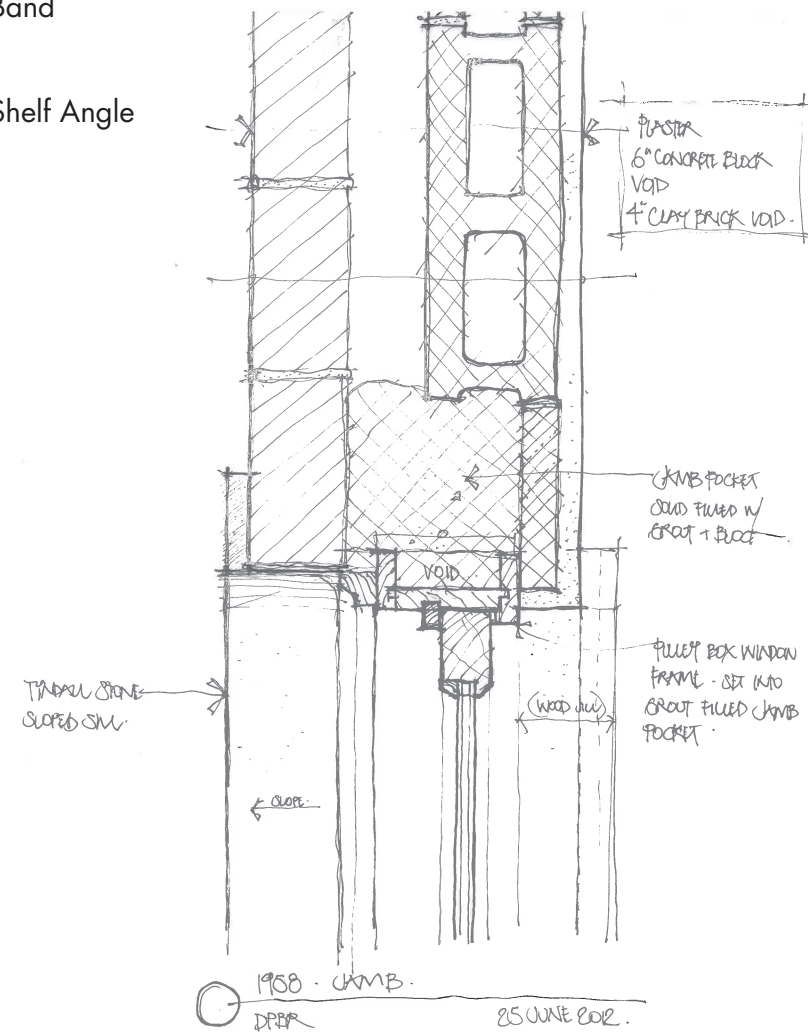


Figure 44 - 1958 Window - Site Observations
- Sketch Detail - Level 1 Jamb

Wood blocking infill
below structural steel
Shelf Angle

Sealant Joint
"Face Sealed"

Void (Airspace) behind
brick veneer



Figure 45 - 1958 Window - Head and Jamb

Plaster returns

Concrete block and
mortar "rubble fill"

Tyndall Stone Sill



Figure 46 - 1958 Window - Sill and Jamb

2.3 Building Review - 1958 Windows

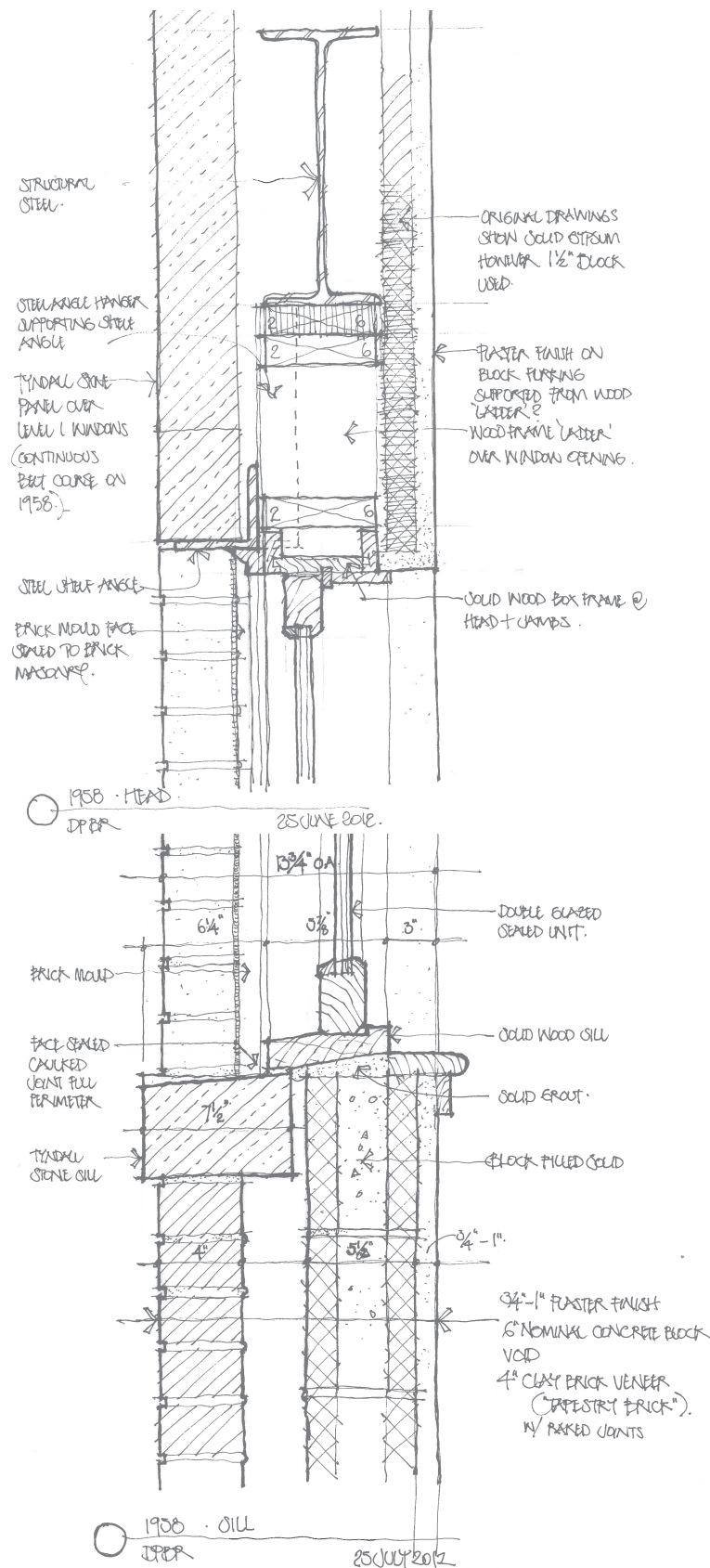


Figure 48 - 1958 Window - Site Observations - Sketch Detail - Head and Sill - Section

Wood ladder frame blocking between window head and underside of structural steel.
Steel shelf angle

Window box frame assembly



Figure 49 - 1958 Window - Head

Solid wood window frame sill

Tyndall Stone sill

Concrete block grouted solid beneath window sill



Figure 50 - 1958 Window - Sill

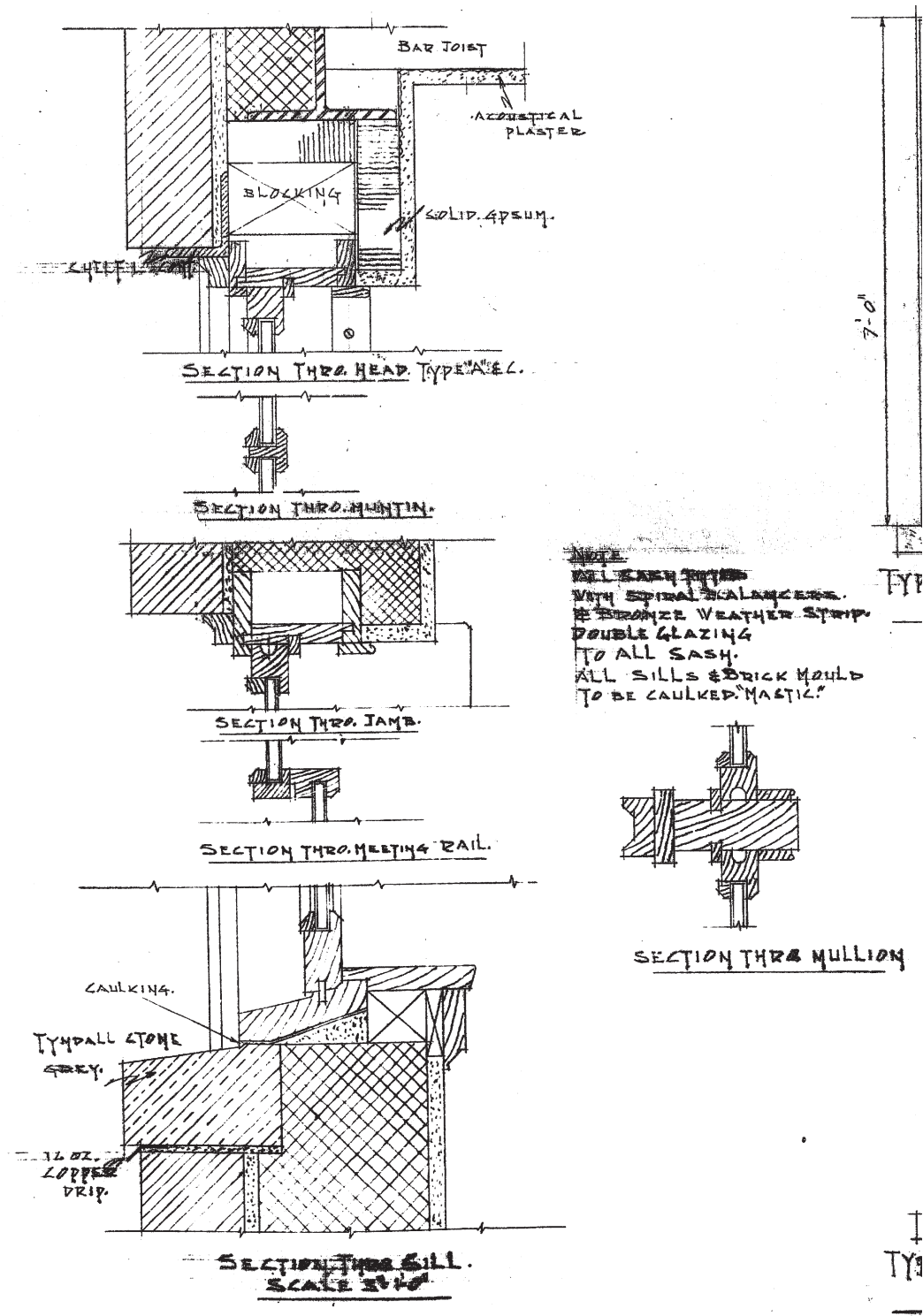


Figure 51 - 1958 Window - Original Drawings - Section Details

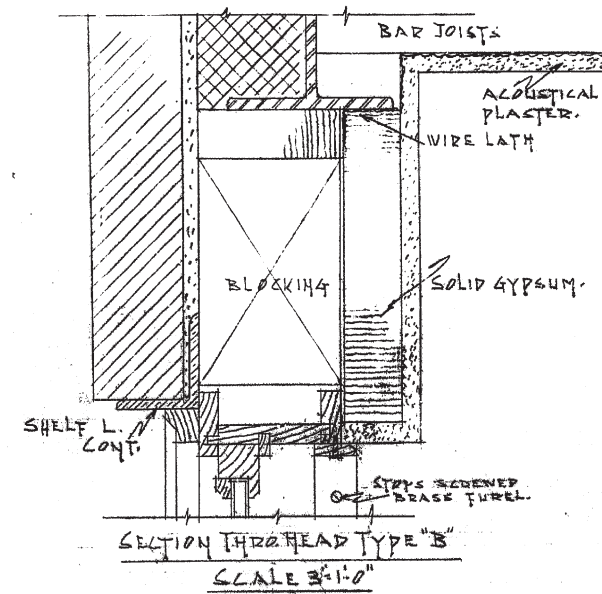


Figure 52 - 1958 Window - Original Drawings - Section Detail at Head

2.3.3 Attic and Roof

Attic spaces accessed in the original building revealed a significant amount of wood framing. While there is evidence of prior water entry there was no evidence noted of chronic water entry. Exposed masonry walls in the attic spaces were free of significant efflorescence. Access to the cupola space revealed black staining in the upper reaches of the structure indicative of local mold growth.

Solid wood plank roof sheathing supporting built-up roof system

1922 Exterior attic wall (uninsulated)



Figure 54: 1922 Typical Attic Space



Figure 53: 1922 Spire Interior - Black stains indicate mold growth on wood members.



Figure 55: 1922 Mechanical Room - Gambrel Roof



Figure 56: 1922 South West Rooftop



Figure 58: 1922 South West Roof



Figure 57: 1922 South East Roof and Spire



Figure 59: 1958 Roof

2.3 Building Review - Attic and Roof



Figure 60: 1922 Roof Cut



Figure 61: 1946 Roof Cut



Figure 62: 1958 Roof Cut



Roof Assemblies

1922 Roof Assembly

Exterior
Gravel
Asphalt Tar
+/- 10 layers tar paper
Wood plank ship-lap sheathing
Interior (Attic)

1946 Roof Assembly

Exterior
Gravel
Asphalt Tar
Roofing Felt/Paper
2 layers 1/2" thick fibreboard
Tar paper
Wood plank ship-lap sheathing
Interior (Attic)

1958 Roof Assembly

Exterior
Gravel
Asphalt Tar
Single ply roofing felt/paper (1/8" to 1/4" thick)
Roof slab (3" Zonolite lightweight concrete)
Interior (Occupied space)

1922 Gambrel Roof

Asphalt Shingles
Building Paper
Wood Plank Ship-lap sheathing

1922 Chimneys/Spire

Copper Shingle or Standing Seam Metal roofing
Building (tar) paper (Assumed)
Wood deck



Figure 62: 1958 Roof Cut



Figure 62: 1958 Roof Cut

2.3.4 Above the Roof: Parapets, Chimneys, Doghouses, Daylighting and the Spire

Above the roof level there exists a number of elements that also comprise important aspects of the building envelope. Numerous parapet conditions, projections above the roof and penetrations through the roofing system will all need to be addressed in an eventual re-roofing of the Dentistry Pharmacy building.

Parapets

Several different parapet conditions exist and a variety of methods are employed in their waterproofing and weathering protection.

1922 Building

The 1922 building has predominantly stone parapet caps, some of which have been capped with galvanized steel and others that have been left exposed. The sheet metal cap is of welded construction in some locations and in others has been caulked with sealant - significant areas of which are rusting and there is evidence of failed seaming. In addition the 1922 building has a number of decorative Tyndall stone elements (urns, finials and special profiles) that have been left exposed.

In several locations the back side of the parapets that rise above the roof level have been clad with a galvanized sheet metal some of which is original construction. Rust is apparent in many locations.

1946 and 1947 Wings

The 1946 and 1947 wings also have stone caps and have been capped with a brown pre-finished sheet metal cap and flashings in most locations. At the wings the parapet does not rise much above 4-6 inches (100-150mm) above the gravel cover with a sloped back that is most likely concealing a wood cant strip.

1958 Centre/North Wings

The newer portion of the building has only a pre-finished metal parapet cap with no stone.



Figure 63: 1922 Parapet - East Side



Figure 64: 1922 Parapet



Figure 66: 1922 Parapet



Figure 67: 1922 Parapet



Figure 65: Above Roof Keyplan

Chimneys

The 1922 building incorporated several intake/exhaust chimneys in its ventilation design. These chimneys are still in use and rise above the roof level forming significant visual components of the roofline. In all cases these extensions are hollow masonry constructions with copper louvres and standing seam copper roofing and flashing in a hip roof shape. At the roof deck galvanized sheet metal flashing extends vertically up the masonry face typically sealed 12-16" above the roof with a termination bar and sealant joint. In some cases there are access doors into these shafts at the roof level.



Figure 68: 1922 Chimney



Figure 69: 1922 Chimney

Doghouses

Several mechanical "doghouses" exist at almost all of the various roof levels. Some of these are used for roof and attic access while others house fan rooms for intake and exhaust. Sheet metal cladding covers a wood frame construction in the 1922 building while the tops of the two north stairs in the East and West wings are solid masonry construction.



Figure 70: 1922 'Doghouse'



Figure 71: 1922 'Doghouse'



Figure 72: 1922 'Doghouse'

Daylighting

There are two distinct types of daylighting evident at the roof level - the clerestorey's above the East and West Theatres and the skylight over the East Wing.

Theatre Clerestoreys

Originally the Theatre clerestorey glazing brought light in from the south deep into the theatre space directly in the summer months and indirectly reflected off a plaster covered inclined wall in the winter months illuminating the assembly below. At some point since, the clerestorey lighting was painted black and then completely clad from the exterior with horizontal sheet metal siding.



Theatre Clerestorey clad with metal siding

Figure 73: 1922 Parapet

Skylight(s)

In the original 1922 design the East and West wings incorporated a skylight at the midpoint of the length of the wing. Only the East skylight remains and is clad on the south side with galvanized sheet metal and on the north side has retained its original georgian wire glazing.



Figure 74: 1922 Parapet



Figure 75: 1922 Parapet

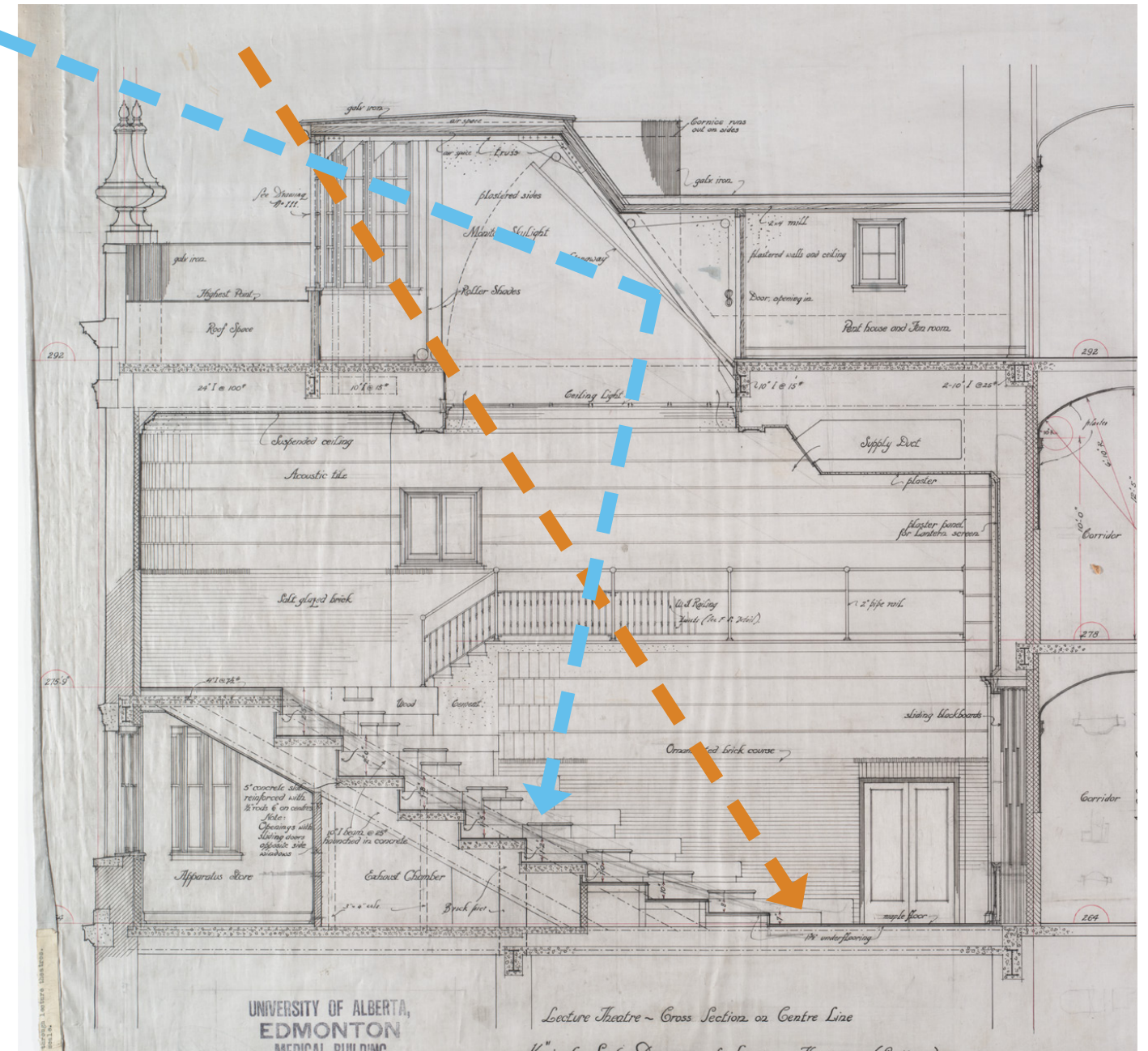


Figure 76: Theatre Clerestorey

The Spire

The spire is the defining visual element of the Dentistry Pharmacy building and in addition to being the landmark point of the building also has a functional purpose acting as a mechanical exhaust chimney.

Visually the Spire is comprised of four separate materials in distinct 'layers' from top to bottom - metal, wood and two levels of masonry - a stone plinth supported by a clay brick base. Structurally the spire cupola is a wood structure set on a corbelled brick masonry foundation that is supported at the top of the central East-West corridor.

Four oval windows set into the brick base bring light into the spire interior.

The spire punches through the peak of the gambrel roof that covers the building from the decorative curved parapet of the main South entrance to the North wall of the 1922 building.



Figure 77: 1922 Parapet



Figure 78: 1922 Parapet



Figure 79: 1922 Parapet



Figure 80: 1922 Parapet



Figure 81: 1922 Parapet

2.3 Building Review - Attic and Roof

2.3.5 Structural Systems - Site Analysis

The external masonry walls were observed from grade level. The masonry was generally in good condition with no evidence of efflorescence or spalling of the brickwork. We did not observe any cracking of the brickwork or significant cracking within the mortar that would indicate movement or settlement of the walls. From grade level the walls do not appear to be out of plumb. There are extensive areas where the mortar has deteriorated or where joints are missing. It should be noted that our observations were from the outside of the building, bearing conditions of steel beams and timber sections will need to be assessed upon removal of ceilings and plaster during the refurbishment works. The cavity of the 1958 wall construction was not inspected to observe the condition of the brick ties or obstructions within the cavity.

The exterior walls to the 1922 building are load bearing and any structural deficiencies in the walls need to be remediated to ensure the continued performance of the building. We must also ensure that during the refurbishment that we do not induce any failure or degradation of the masonry. Of particular importance is maintaining the current moisture content of the bricks by not altering the the location of the current dew point within the depth of the wall assembly. Structural elements bear on the exterior wall directly and again any change in the moisture content of the wall may induce degradation of these members at the bearing points.

2.3.6 Mechanical Systems - Site Observations

The ventilation system in the 1922 wing includes a steam grid humidifier, which has been observed to be operational. The mechanical systems in the 1958 wing do not incorporate provisions for humidification.

Entry into and exit out of the building has not demonstrated a positive or negative pressure differential; through spring and summer months, the building appears to be operating at or near neutral pressure.

Considering that the building envelope has performed well over the decades, the strategy going forward is to maintain existing indoor/outdoor pressure differential relationships. Accordingly, it was agreed that four (4) pressure differential meters would be strategically located in the building to measure the delta pressures and record a trend that would be modeled with newly developed mechanical systems.

2. Examination of Existing Conditions



3. Building Analysis

3.1 Overall Behaviour

While mechanically ventilated the vertical air ducts connecting to the east west wind tunnel which in turn connects to the central cupola forms the basis of a natural ventilation system in the original 1922 building. This effect would be supplemented by the action of actual chimneys. Winds passing the cupola would generate a negative pressure in the attic space assisting the air driven up the ducts by thermal buoyancy to be drawn up and out of the structure. For this process to work one would have to open and close the grill shutters and the cupola windows with varying weather conditions and temperature.

While site observations indicate the natural ventilation flow path still exists its operation has been supplanted by the mechanical systems and the cupola is part of the mechanical exhaust duct. The mold in the cupola space is a direct result of the accumulation of moisture deposited from the exhaust of interior moist air. Accidental moisture entry also occurs via air passage through openings in the ceiling plane.



Figure 82: 1922 Spire Interior

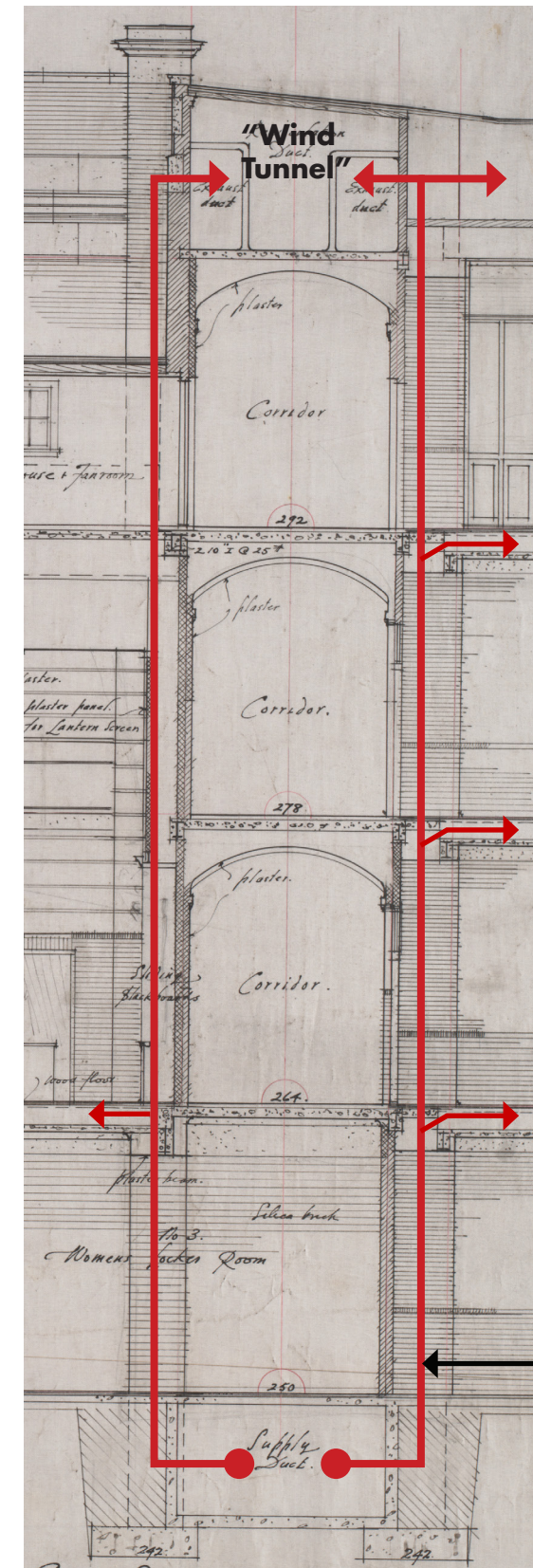


Figure 83: 1922 Path of Ventilation

An implication of the wind tunnel and the high central cupola is the effective height of the building in terms of the position of the neutral plane is increased. Long term pressures below the neutral plane result in net infiltration to the interior and pressures above the neutral plane result in predominately exfiltration. While a longer term air pressure monitoring programme is being set up spot site measurements indicate that under current and likely historic conditions most of the exterior walls are under a negative pressure with the neutral plane at or near the roof eave level. While not particularly attractive from a thermal comfort or energy perspective a net infiltration condition reduces the interior moisture loading of the walls which is beneficial to long term performance.

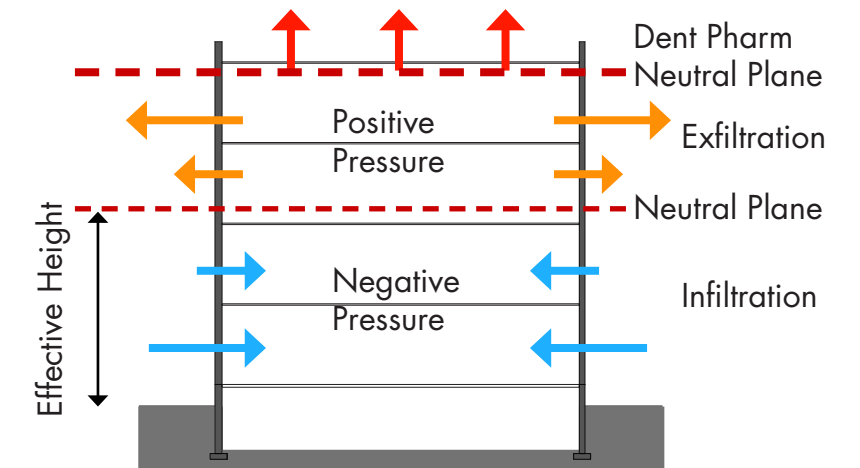


Figure 84: Neutral Plane Concept

As the various additions have been built the influence of natural ventilation has been reduced. The proposed plan to enclose the courtyards will effectively reduce the area of exterior wall reducing both ventilation opening and improving overall energy efficiency through the use of a highly insulated roof. Subject to confirmation from on site monitoring it is expected that the courtyard roof addition will lower the neutral plane placing a greater area of wall under positive pressure (exfiltration conditions). As such the need to improve air tightness of the envelope is emphasized. Mechanical system design must recognize this effect and be adjusted to reduce it.

Within double structure lining central corridor of 1922 building masonry shafts extend from basement level (concrete supply duct beneath central corridor) to fourth floor attic and "wind tunnel".

3.2 Above Grade Walls

Control of water/water vapour flow

The 1922/46/47 exterior stone/masonry walls were built using traditional construction techniques blended with slightly more modern transitional techniques with embedded steel structural members. No overall distress was noted in any wall area and deterioration noted in the walls is primarily focused at the poor condition of the mortar joints. Given that the walls were reported repointed in 1998 one can only assume a very poor repointing job was done. There are also reports of plant growth on the walls that has subsequently been removed. Plant growth can deteriorate mortar joints.

Water penetration resistance is derived initially from the exterior detailing (overhangs, cornices, sills, etc.), the tightness of mortar joints and finally from the mass of the wall itself. As noted above the poor condition of the mortar joints along with the raked style of the joints significantly reduces water penetration resistance. Repointing with a properly tooled concave joint would improve long term performance but would likely be architecturally unacceptable.

To a point the relatively porous stone and brick will absorb moisture and once the rain event is over and drying conditions return retained water will evaporate to the exterior and/or the interior depending on the depth of water penetration. Excessive amounts of water may drain freely in either unfilled collar joints or potential wall cavities. Drying to the interior is limited by the extent of interior finishes however the vent spaces evident between the plaster lath and the inner wythe (clay tile reported in some locations) or voids as noted in the window investigation provides for some drying potential. Observations of interior exposed masonry, particularly in attic spaces, indicate little active drying to the interior over time.

The 1958 cavity wall design relies less on mass to provide water penetration resistance and more on free vertical drainage in the cavity. The test openings indicated that the cavity is not completely clear and flashings may not be complete however little long term deterioration is evident.

As the historic long term interior relative humidity levels and hence interior moisture content has been relatively low the importance of an interior vapour retarder is reduced. The default retarder becomes the paint finish on the plaster walls regardless of the date of construction. As in most historic buildings it is the continuity of the plaster finishes that plays a significant role in controlling interior to exterior vapour flow by limiting air leakage.

Control of air flow.

As indicated the default plane of maximum airtightness is the interior plaster finish. This plane is more continuous than any collar joint or parging plane within the solid masonry wall. Aside from the lack of continuity at the level of floor slab pockets (space between ceiling and floor finish), above ceiling finishes, in attic spaces and at door and window casings, the interior plaster is relatively continuous in all occupied spaces above grade and ties to ceiling finishes.

The primary focus with respect to air leakage control in a cold climate is the exfiltration of warm moist air into wall cavities and the potential for moisture accumulation and subsequent wall damage if the wall freezes. Review suggests that the long term operating mode of the building results in a negative pressure (infiltration) being applied over much of the wall area for much of the heating season. This operation mode coupled with a relatively dry interior condition has undoubtedly contributed to the relatively good condition of the exterior walls to date. The importance of the interior air leakage control plane increases if this operating mode or interior conditions change. The concern relates primarily to a change in long term internal air pressure.

Aside from a change in overall pressure a change in the pressure distribution across the walls or a shift in the neutral plane would also impact the moisture accumulation in the walls. If the plaster plane is retained then concern would focus on the non-plaster coated areas particularly in the upper half of the building. The addition of a parging layer to seal exposed masonry would be considered.

Control of Heat Flow

As with most buildings the age of the Dentistry Pharmacy building no defined thermal insulation is provided in the wall assembly. Taken as a solid wall of masonry or masonry/stone the 1922/46/47 assembly has an inherent insulating value of RSI 0.5 to RSI 0.75 and the 1958 assembly slightly less . There is also a contribution to the thermal performance by the mass of the wall in terms of thermal lag which tends to delay peak heating and cooling loads. Simple thermal modeling of the solid wall section indicates that at a steady state winter condition approximately one third to one half of the wall thickness would be subject to freezing. The exterior brick would be subject to the greatest number of freeze thaw cycles and the condition of the brick indicates reasonable durability. As the interior wythe of brick in a solid masonry wall are often of lower quality (less thoroughly fired) the performance of the exterior brick may not be an indicator of the performance of the interior brick wythes.

Freezing of the brick and associated damage is an issue if the masonry is sufficiently saturated. An estimation of moisture content at various depths relative to its temperature was made using WUFI, a hygrothermal analysis tool. This tool provides a reasonable model of water movement by diffusion and capillary suction under historical climate conditions. A WUFI analysis of the existing conditions indicates that for most of the year most of the drying of the wall occurs to the exterior. Drying does occur to the interior but this drying is significantly less than the exterior drying. The simulations indicated that for typical brick and stone properties the wall materials do not approach saturation thus reducing the risk of freeze thaw damage. However this assumes the interior wythe bricks to have similar properties as the exterior brick and that the joints in the wall are tight thus limiting liquid water flow.

In order to assess the sensitivity of the wall to the addition of interior insulation the hygrothermal simulations were repeated with insulation added to the interior wythe beneath the painted plaster layer (assumed to be either 1" or 3" of urethane foam). It was found that drying to the interior was essentially eliminated. The depth of freezing in a steady state condition extended essentially through the wall. As such thermal movements and the development of cracks would increase with an insulated option. The moisture content of the wall materials increased over the non-insulated case but still remained below critical saturation levels. Again this is for the case of a water tight exterior face.

As noted the above discussion applies to the 1922/46/47 solid wall areas. The 1958 wall is subject to different behaviour due to the at least partially ventilated void behind the face brick. This void promotes drying of the brick from the back side but also, depending on the degree of ventilation, exposes the brick to much colder conditions for longer periods of time. Assuming no header courses and metal brick ties the exterior face brick is thermally de-coupled from the more massive block backup wall. As such the addition of insulation in concept to the block wall has less impact on the face brick for the veneer wall compared to the solid masonry wall area.

Insulating the block wall on the interior face would reduce the mass effect, place structural elements in a colder environment and induce movements between the insulated and non-insulated wall areas. However given that natural movement joints exist at the perimeter of the block backup to the structure this is less of a concern. It is therefore feasible to insulate the interior of the 1958 wall area with due attention to air seals and vapour retarders as per contemporary construction.

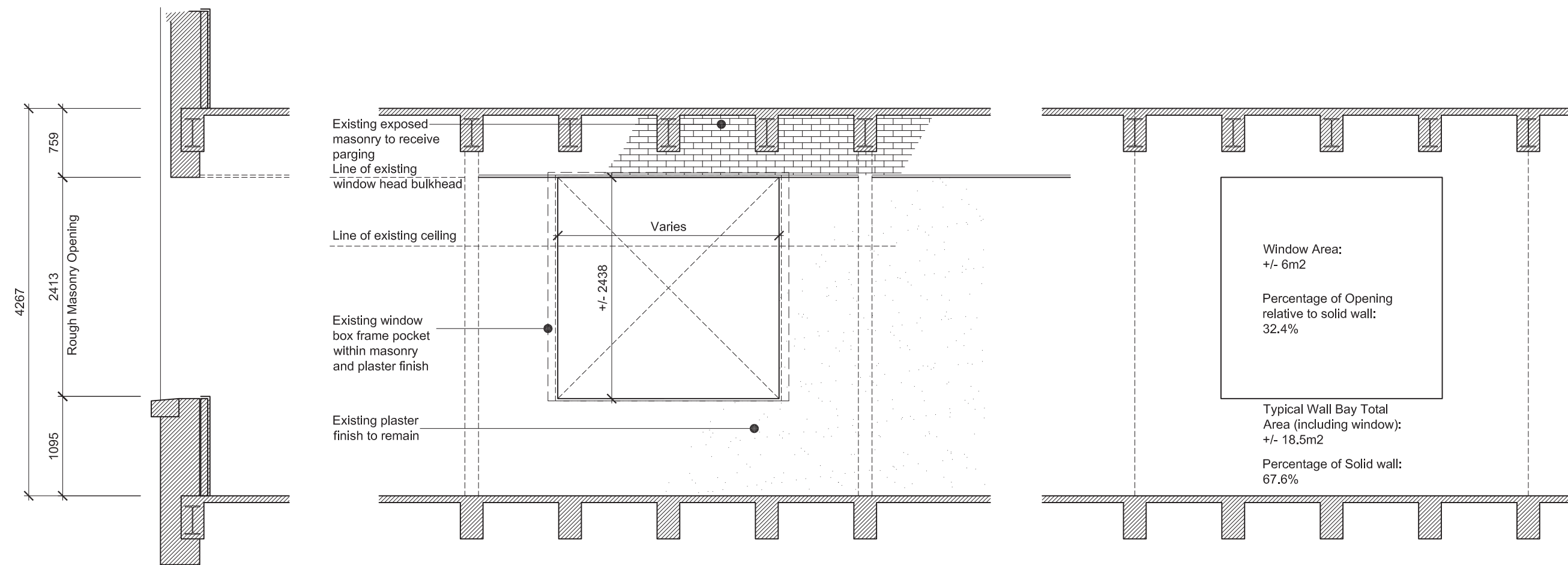


Figure 85 - Typical Window/Wall Relationship

3.3 Windows and Doors

Given the stated intent to replace the windows a detailed discussion of the existing window performance is unnecessary. However the long term behaviour of the windows with respect to air flow and heat flow can influence design moving forward.

Control of air flow

The lack of weatherstrip, ill fit, sash cord pockets and ineffective hardware renders the original windows relatively drafty and lacking in air tightness to meet contemporary standards. Local air infiltration would contribute to thermal discomfort adjacent the window; would have a negative impact on overall window thermal performance and will result in localized glass condensation. Drafty windows do however contribute to the overall ventilation of the building and reduce excessive humidity levels. The increased air tightness of the new window system must be considered in the overall ventilation strategy.

Similar comments apply to the original doors where significant openings exist about the door perimeters and the meeting stiles. Simple adjustment to the perimeter details would significantly improve airtightness.

Control of heat flow

Replacement windows will have lower U values than the existing assemblies due primarily to the use of low e coated glass and gas filled units. Historically lower performing windows have been a simple indicator of excessive relative humidity. Better performing windows do not function as well as a humidity indicator.

Window Selection

To meet mechanical design expectations a wide variety of glass types are available incorporating low e coatings and argon gas fills into insulating glass units. Unit selection can be made based on performance as well as appearance. The presumed intent is to provide non-operable historically sympathetic windows to replace all the existing window assemblies. These windows would be a custom or modified custom window and the volume for the project justifies such an approach. Frame type can be fiberglass as mentioned in the concept study or thermally broken aluminum and both can be tendered and evaluated based on cost and performance.

3.3.1 Window Types



Figure 86 - Window Types - 1922 Building



Figure 87 - Window Types - 1946/47 Buildings



Figure 88 - Window Types - 1958 Buildings

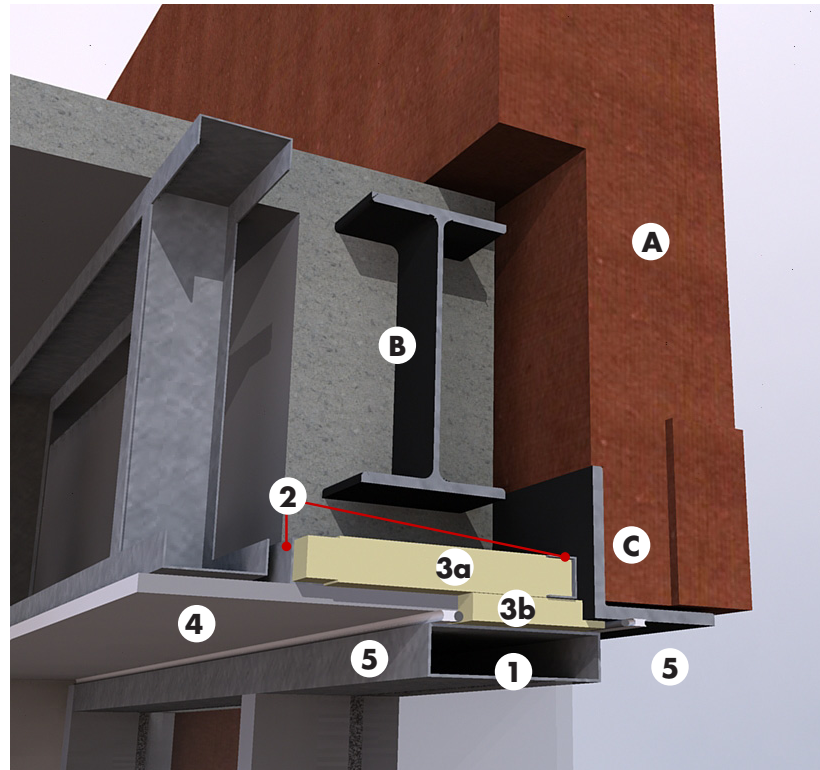


Figure 89 - 1922 Window Installation - Head

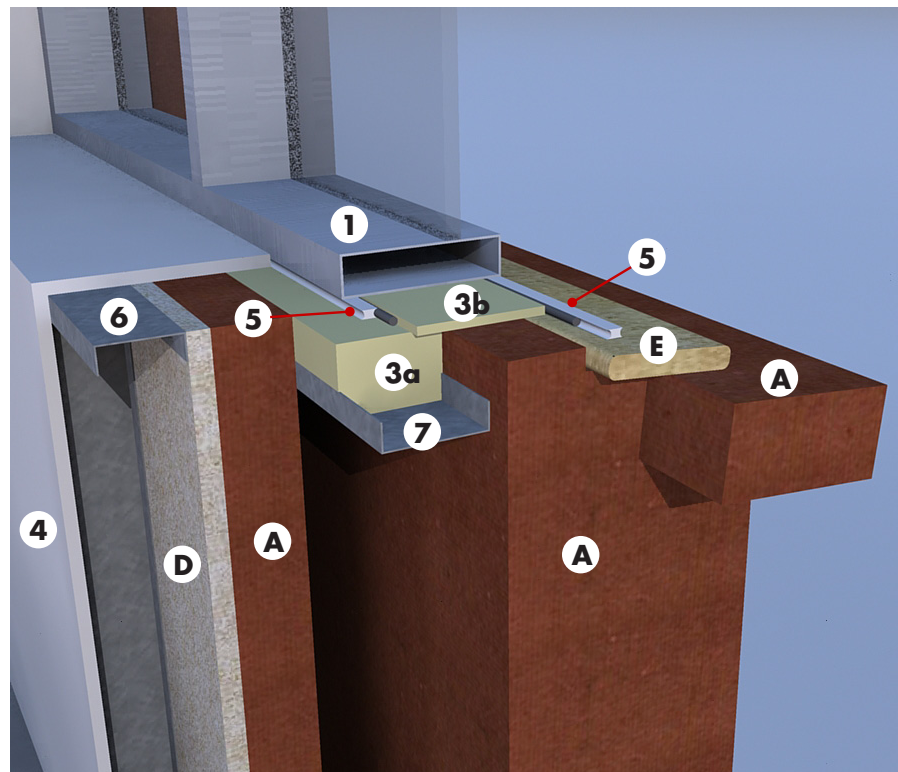


Figure 90 - 1922 Window Installation - Sill

Window Installation

Window installation into any existing building is subject to variances in the rough opening size particularly when the building has been built in different phases using varying techniques. While some standardization of window size will be possible it is likely that window sizes will have to be grouped into families by similar size. The connection of window to rough opening is critical from an air and water penetration control perspective. Two basic approaches have been used which include either creating a solid surround by filling voids left by removal of sash cord boxes with brick or grout or by developing an adjustable sheet metal closure and then filling voids with spray foam. Both approaches are valid and often a site mockup using both is appropriate to confirm the final approach.

The sketches to the left illustrate window installation approaches.

Existing Building Elements to remain post demolition:

- A.** Existing Masonry
- B.** Existing Concrete encased steel beam
- C.** Existing steel shelf angle over window openings typical
- D.** Existing Interior Plaster Finish
- E.** Existing Tyndal Stone Sill Flashing

Elements of New Window detail:

- 1.** New thermally broken extruded aluminum "Replica" window frame.
- 2.** Steel stud ladder framing at head and jamb anchored to existing masonry or steel structure.
- 3a.** Spray applied foam insulation (first application)
- 3b.** Compressible Spray applied foam insulation (second application)
- 4.** Gypsum board
- 5.** Foam rope and sealant
- 6.** Interior envelope finish: 16mm gypsum board on 64mm or 92mm steel studs spaced off existing masonry/ existing plaster by 12mm.
- 7.** Sheet metal closure for support of foam insulation at sill.

Sequence of Installation:

1. Remove existing brick moulding and interior trim, window frame and sash pulley system hardware, prepare existing opening by removing remaining sealant, interior plaster returns (to face of interior wall),
2. Install steel stud ladder frame at jambs and head anchor to masonry/steel structure.
3. Apply spray foam insulation to steel stud ladder cavity and all gaps to adjacent masonry/steel.
4. Install drywall/sheet metal over ladder frame/foam assembly for fire protection.
5. Install new window frame.
6. Install glazing.
7. Apply compressible foam insulation to gap between window frame and steel stud/foam insulation assembly for contiguous seal and thermal break. Install foam rope and sealant to full perimeter of window frame.
8. Apply new parging to wall all exposed masonry on interior.
9. Install interior steel stud framing. Rough in building services.
10. Install 16mm gypsum board (optional until fit-up). Paint.

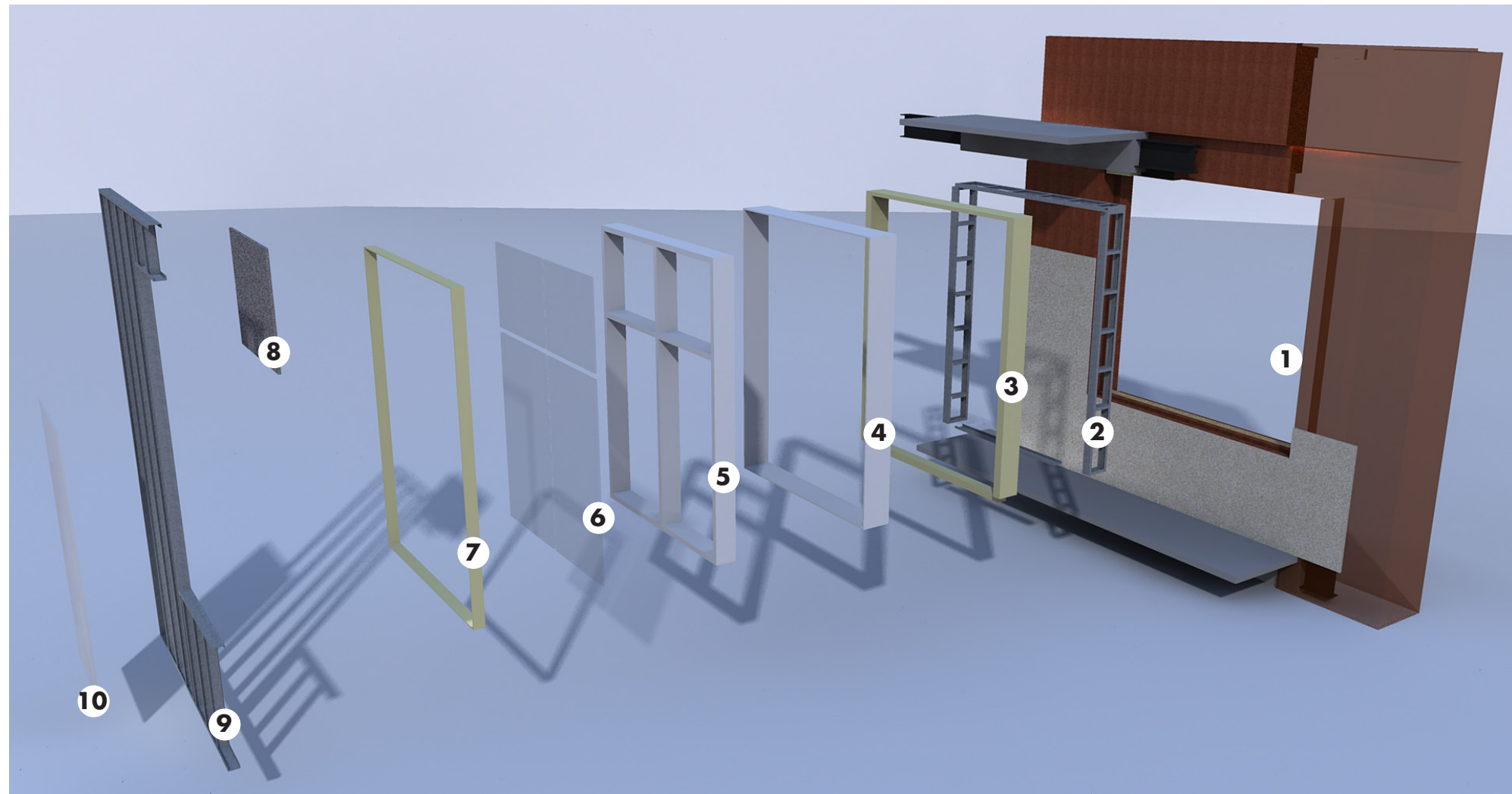


Figure 91 - Proposed Sequence of Window Installation

3.4 Attic and Roof

The existing flat BUR system and the metal clad roof areas are generally performing well. This is in part due to the relatively recent renewal. The current development plan however includes the replacement of most of the roof areas. This provides the opportunity to significantly upgrade the insulation at the roof level. Unlike the walls, which may deteriorate with increased insulation levels, roof level insulation can increase to maximum limits economically feasible. Any increase in roof insulation should be coupled with increased air tightness at the roof plane.

The concept of roofing over the courtyard with a very high performance roof and upgrading the existing roofs thermally is an effective means of increasing overall building envelope performance by bringing the courtyard wall area indoors eliminating their effect on overall heat loss. The outer walls will have upgraded windows which coupled with the exterior wall area reduction would be the principal increase in thermal performance attained in the redevelopment.

3.5 Parapets

The existing metal parapet caps will be replaced in the re-roofing work and the backs of the parapets clad with a ventilated rainscreen of metal cladding. Because the exterior walls are masonry construction it is important that the parapet caps and the metal cladding on the backside are vented to prevent capturing moisture within the wall cavity where it would be subject to freeze-thaw cycles. Details will be developed to make appropriate waterproofing connections between the roofing membrane, parapet cladding and caps.

3.6 Structural Systems - Analysis

From a structural perspective mortar provides a uniform transfer of load through elements and acts as a gap filler to keep out the weather. In specifying a repointing mortar that is compatible with the masonry units the objective is to achieve one that matches the historic mortar as closely as possible so that the new mortar can co-exist with old. The new mortar must conform to the following criteria:

- The new mortar must match the historic mortar in colour, texture and tooling. (Laboratory testing will be required to identify the components of the mortar and their proportions)
- The sand must match the sand of the historic mortar. (If we match the sand the colour and texture will usually match the original)
- The new mortar must have greater vapour permeability and be softer (Measured in compressive strength) than the existing masonry units.
- The new mortar must be as vapour permeable and as soft or softer than the historic mortar.

3.7 Mechanical Systems

Mechanical ventilation systems can readily be commissioned to reflect the positive or negative pressure relationship established by the metering provisions. This will be accomplished by managing the air volume relationship between outside air delivered into the building, the volume of air exhausted, and the volume of air exhausted.

4. Conclusions and Recommendations

With respect to the Dentistry Pharmacy Building the future restoration/integration programme should include the following themes: overall building behaviour, improvements to the exterior masonry walls, improvements to the windows and doors and improvements to the roof.

<ul style="list-style-type: none"> Historically the exterior walls have operated under minimal positive pressures and with low interior moisture loads. This interior environment would be maintained in the redeveloped building. 	<p>Proposed Solution: Mechanical systems to operate to provide building pressurization and humidification at existing pre-renovation levels.</p>
<ul style="list-style-type: none"> Known weaknesses in the air barrier of the masonry wall system should be addressed primarily through the use of vapour permeable planes such as parging. Of particular concern are masonry walls exposed to the interior and window perimeters. 	<p>Proposed Solutions: Masonry exposed to the interior to be parged from top of existing plaster finish to underside of floor slab above - or where more appropriate, new plaster finish to match existing to underside of slab above where exposed to the finished interior. New improved window perimeter details to be implemented.</p>
<ul style="list-style-type: none"> Capping the courtyards with roofs as part of the atrium development has implications with respect to building internal pressure which must be considered mechanically. More significant is the overall improvement in energy performance achieved by effectively reducing the exterior wall and window area. 	<p>Proposed Solution: Mechanical system to accommodate changes in building pressurization induced by the introduction of the Atrium enclosure.</p>
<ul style="list-style-type: none"> The minimum risk intervention with respect to the masonry walls is to concentrate on achieving reliable air seals and improving exterior water shedding through flashings and repointing the deteriorated exterior joints. Insulation is not added in the minimum risk solution. The risk of long term deterioration increases with increased levels of interior insulation however the risk increases significantly in the solid masonry walls for insulation values greater than R4-6 (assuming foam insulation). The cost benefit of this minimum level of insulation must be evaluated mechanically. The risks of deterioration due to insulating the 1958 block walls are lower and again must be examined from a cost benefit basis. 	<p>Proposed Solution: No new insulation will be applied to the inside of the building envelope to the 1922, 1946 or 1947 wall assemblies in order to minimize the risk that a change in the existing performance of the assembly may cause damage over time to the masonry by altering the balance of infiltration and exfiltration of air and moisture that has maintained the wall in good condition for as long as 90 years. Instead, in concert with the other proposed solutions here, improving the performance of the windows and vapour permeable membranes (plaster/parging) and a mechanical design that seeks to maintain the existing interior climatic conditions with respect to humidity and pressure, the proposed solution seeks to attain a balance to maintain the existing pre-renovation condition. The addition of insulation to the interior of the 1958 building envelope is under consideration and needs further study to determine the cost benefit of the solution.</p>
<ul style="list-style-type: none"> Window upgrades can be considered in isolation and the highest performing conventional products assembled in an historically sympathetic manner is the recommended approach. 	<p>Proposed Solution: New thermally broken 'replica' aluminum or fibreglass windows with double glazed, low emissivity, argon filled insulating units will replace the existing wood frame windows.</p>
<ul style="list-style-type: none"> Existing wood doors can be refurbished to meet contemporary expectations. Replica wood replacement can be considered. 	<p>Proposed Solution: Existing major entry doors (South, East and West wings) may be considered for refurbishment/re-use in the renovation however most other doors will be replaced with contemporary door technologies as appropriate (aluminum frame entry doors, insulated steel for service doors)</p>
<ul style="list-style-type: none"> Roof insulation upgrades can be considered in isolation and the highest thermally performing economically feasible roof assembly should be considered. 	<p>Proposed Solution: All existing and new roof areas are to receive new SBS roofing membrane systems with minimum R40 roof insulation.</p>
<ul style="list-style-type: none"> Upgraded parapet protection can be achieved in tandem with the roofing system installations to address these vulnerable locations of the building envelope. 	<p>Proposed Solution: Existing parapets to receive new vented metal parapet caps and rainscreen cladding on the roof side of the parapet.</p>



- *Building Code Analysis*

**BUILDING CODE ANALYSIS - SCHEMATIC DESIGN
DENTISTRY PHARMACY BUILDING REDEVELOPMENT**

A. Applicable code:

Alberta Building Code 2006
The following Code Analysis indicated how the Code will be approached with respect to the Dentistry Pharmacy Building Redevelopment. The building and its anticipated redevelopment has been reviewed as if a new building under the Code and those items in green reflect where the historic nature of the building does not align directly with the ABC 2006. Statements in red are internal reminders to the design team to confirm Code compliance.

B. Volume 1

Section	Description	Reference
Part 1 - COMPLIANCE		
1. Application of this Code		
1.1	Code applies to change in occupancy or alteration of any building.	1.1.1.1
1.2	Application of existing buildings applies of building legally built prior to September 2007.	1.1.1.2.1)
1.3	If a building is altered the level of life safety and building performance shall not be decreased.	1.1.1.2.2)
1.4	AHJ shall accept any construction or condition that lawfully existed if it does not constitute an unsafe condition.	1.1.1.2.3)
1.5	A change of use or alteration of a building is permitted if level of life safety or building performance is acceptable to AHJ.	1.1.1.2.4)
1.6	AHJ may accept an alternate that achieves an appropriate level of safety for the activity for which building will be used.	1.1.1.2.5)
1.7	AHJ may accept existing conditions not in complete compliance to this Code.	1.1.1.2.5)
1.8	Construction Site Safety under the AFC 5.6 needs to be addressed in the design development stage and finalized once definite phasing is defined as construction documentation begins. A 1 hour FRR separation is needed to separate construction areas from occupied areas. SLOWPOKE is currently only portion of building remaining active during construction.	

C. Volume 2

Section	Description	Reference
Part 3 - FIRE PROTECTION, OCCUPANT SAFETY AND ACCESSIBILITY		
1. Occupancy		
1.1	Building is classified according to major occupancy (Table 3.1.2.1).	3.1.2.1.1)
1.2	Building used for more than one major occupancy shall be classified according to all major occupancies.	3.1.2.1.2)
1.3	Major occupancies for Dent Pharm may be:	Table 3.1.2.1
	: A2 Assembly occupancies	
	: D Business and personal services occupancies	
	: E Mercantile	
	: F2 Medium-hazard industrial occupancies	
	: F3 Low-hazard occupancies	
1.4	Appendix A Major occupancy classification	A.3.1.2.1
	: A2 * lecture halls	
	* art galleries	
	* museums	
	* schools and colleges	
	: D * offices	
	: E * retail	

Section	Description	Reference
	: F2 * laboratories	
	* storage rooms	
	: F3 * laboratories	
	* storage rooms	
	SLOWPOKE must meet CNSC requirements and life safety requirements of ABC 2006. 1 hour separation to space is needed.	IGI email 2012/07/16
1.5	Major occupancies are to be separated from other major occupancies by fire separations with a fire resistance rating (Table 3.1.3.1).	3.1.3.1
	: A2 - D 1 hour	
	: A2 - E 2 hour	
	: A2 - F3 1 hour	
	: D - E none	
	: D - F3 none	
	: E - F3 none	
1.6	Requirements for fire spread and collapse for multiple major occupancies are based upon overall building height and building area.	3.2.2.5
1.7	Most restrictive occupancy shall apply to whole building.	3.2.2.6
1.8	If aggregate area of all major occupancies in a group or division is not more than 10% of the floor area of the storey than not considered a major occupancy under Building Size and Construction. We need to define 10% limit on a per floor basis (Group E).	JL
2 Non-combustible Construction		
2.1	Non-combustible building to be constructed with non combustible materials.	3.1.5.1.1)
2.2	Non-combustible material permitted when tested to ULC-S135 and meets requirements.	3.1.5.1.2)
2.3	Minor combustible components are permitted.	
2.4	Combustible roofing materials are allowed on roof with an A, B, or C classification.	3.1.5.3.1)
2.5	Combustible roof sheathing and roof sheathing support are permitted if above a concrete deck at least 50mm thick, roof space not more than 1m, openings through concrete deck are protected by concrete shafts, parapet non-combustible and no building services in roof space. Ref. to Diagram 2.5a and 2.5b. Combustible joists, rafters, walls, and sheathing may have intumescent paint applied and a sprinkler system will be provided within attics.	IGI email 2012/07/16
2.6	Combustible glazing and skylights are permitted with conditions. After conditions ASTM E - 89 UL 723.	3.1.5.4
2.7	Combustible components in exterior walls are permitted if non structural. Ref. to Diagram 2.7a, b, c, and d	3.1.5.5 JL
2.8	Wood nailing elements are permitted if attached directly to non combustible backing and concealed space is not large than 50mm.	3.1.5.6
2.9	Combustible millwork including shelves, millwork, handrails, doors and door frames, interior show windows, and frames are permitted.	3.1.5.7
2.10	Combustible flooring elements. Ref. to Diagram 2.10a, b, c, d, e, f, g, h and i Plank wood floor in 1922 Building can be maintained if voids below are not accessible or open and slab below has spray fire proofing or gypsum board added to deck to achieve a 1 hour FRR separation.	3.1.5.8 IGI email 2012/07/16
2.11	Combustible interior finishes less than 1mm in thickness are allowed.	3.1.5.10.1)
2.12	Combustible interior wall finishes are permitted if not more than 25mm thick and flame-spread rating no more than 150.	3.1.5.10.2)
2.13	Combustible interior ceiling finishes are permitted if not more than 25mm thick and flame spreading rating not more than 25 or fire retardant treated wood. 10% of a fire compartment area ceiling can have a flame spread of not more than 150.	3.1.5.10.3)
2.14	Combustible insulation (not foamed plastic) is permitted if flame spread is less than 25.	3.1.5.12.1)
2.15	Foamed plastic is permitted if flame spread is less than 25 and is covered by a thermal barrier.	3.1.5.12.2)

Section	Description	Reference
2.16	Combustible insulation with flame spread no greater than 500 in a sprinklered building needs a thermal barrier as 3.1.5.12.2) in walls.	3.1.5.12.3)
2.17	Combustible insulation with flame spread no greater than 500 in a sprinklered building needs a thermal barrier as 3.1.5.12.2) in ceilings.	3.1.5.12.4)
2.18	Combustible elements in partitions are permitted (with restrictions).	3.1.5.13
2.19	Combustible ducts and associated materials will not be used.	3.1.5.15
2.20	Combustible piping materials are permitted with restrictions.	3.1.5.16
2.21	Combustible plumbing fixtures will not be used.	3.1.5.17
2.22	Wire and cable that is combustible is permitted with restrictions.	3.1.5.17
2.23	Non metallic raceways are permitted with restrictions.	3.1.5.20
2.24	Decorative wood cladding is permitted facing a street or access route if fire retardant treated. Ref. to Diagram 2.24	3.1.5.21
3 Fire-Resistance Ratings		
3.1	Ratings are determined by results of tests or on basis of Appendix D. Existing wall construction to be defined in design development.	3.1.7.1
3.2	Ratings for exterior walls. See 3.2.3 Spacial separation and Exposure protection.	3.1.7.2
3.3	Ratings of floors, roof, ceilings are for exposure from below, walls from both sides, and exterior walls from inside.	3.1.7.3
3.4	Walls, columns or arches that support a floor or roof shall have a fire resistance rating not less than required floor or roof.	3.1.7.5
3.5	Partitions or walls required to be a fire separations shall be continuous and have a fire resistance rating as defined and openings shall be protected by closures.	3.1.8.1
3.6	Combustible construction that abuts a non-combustible fire separation shall be constructed so its collapse will not cause collapse of fire separation. We need to confirm if we have combustible construction it will not cause collapse. Intumescent paint may assist if conditions are found through site investigation.	3.1.8.2 JL / RT
3.7	Fire separations must be continuous.	3.1.8.3
3.8	Fire protection rating of a closure shall be determined by tests and as per Table 3.1.8.4 3 hr. separation 2 hr. closure 1 hr. separation 45 min. closure	3.1.8.4
3.9	Maximum opening in a fire separation protected by a closure in a sprinklered building is 22m ² with no dimension greater than 6m.	3.1.8.6
3.10	Fire dampers are required where a duct penetrates a fire separation.	3.1.8.7
3.11	Fire damper need not be provided if exhaust duct riser under negative pressure and air flow is upward. See also 3.6.3.4	3.1.8.8.1)
3.12	Fire dampers are not required in fire separations not required to have a fire resistance rating.	3.1.8.8.2).3)
3.13	Non combustible ducts with melting points above 760°C and exhaust directly to exterior at top of service space do not need dampers.	3.1.8.8.4)
3.14	Non-combustible duct will be used with melting point above 760°C penetrating a fire separation between suites can be without damper if duct extends 1m each face of separation.	3.1.8.8.5)
3.15	Kitchen exhaust duct does not need a damper where it passes through a fire separation.	3.1.8.8.6)
3.16	20 min. closures are allowed if rating of separation is 1hr. or less for a public corridor and suite or a corridor and adjacent classrooms, offices, or libraries in a A2 occupancy.	3.1.8.10
3.17	Self-closing device required in all doors in a fire separation.	3.1.8.11
3.18	Hold open devices are allowed on doors in fire separations except exit doors provided device is designed to release. Exit and vestibule doors can be on magnetic hold open (connected to FA) If forming part of corridor path.	3.1.8.12 IGI email 2012/07/16
3.19	Glass block or wired glass can be used for fire separation of less not more than 1hr.	3.1.8.14
3.20	Temperature rise limit for doors to meet Table 3.1.8.15	

Section	Description	Reference
4 Building Services in Fire Separations and Fire-Rated Assemblies		
4.1	Fire stopping is required for mechanical and electrical services.	3.1.9.1
4.2	Services penetrations in a fire resistance rating shall be non-combustible.	3.1.9.2
4.3	Electrical penetrations need to meet this article.	3.1.9.3
4.4	Combustible piping meeting FS & SD values is permitted to penetrate fire separations in sprinklered building.	3.1.9.4
4.5	Membrane ceiling openings to ducts in ceiling space are limited.	3.1.9.5
4.6	A ceiling assembly used as a plenum shall conform to 3.6.4.3 (Max FS of 25 SD of 50).	3.1.9.6
4.7	Firewalls will not be needed. See 7.12	3.1.10
4.8	Concealed spaces in interior walls, ceiling, or crawl spaces shall be separated from concealed spaces in exterior walls and attics or roof spaces. Ref. to Diagram 4.8a, b, c, d, e, f, g and h	3.1.11
4.9	Flame spread rating and smoke developed classification to be determined from testing.	3.1.12.1)
4.10	Interior finishes shall conform to Section 2.3 of Division 3, AFC.	3.1.13.1
4.11	Flame spread rating for walls and ceilings shall not be more than 150. Exits FS maximum 25. Lobbies (as exits) FS maximum 25. Vertical services spaces FS maximum 25.	3.1.13.2
4.12	Light diffusers and lenses can have FS up to 250 and smoke developed classification no more than 600.	3.1.13.4
4.13	Maximum FS of 50 for walls for public corridors, corridor used by public assembly occupancy, or a corridor serving classrooms if sprinklered.	3.1.13.6
4.14	NA	3.1.13.7
4.15	Underground walkways shall have finishes that are non-combustible.	3.1.13.9
4.16	Fire retardant treated wood roof systems from 3.2.2 to meet requirements. Sprinkler protection under 3.2.5.13.6	3.1.14.1
5 Occupant Load		
5.1	Occupant load of a floor area on number of fixed seats in an assembly occupancy or using Table 3.1.17.1. Ref. to Table 5.1	3.1.17.1
	* Space with non fixed seats (assembly)	0.75m ² /person
	* Space with non fixed seats and tables (assembly)	0.95m ² /person
	* Standing space (assembly)	0.40m ² /person
	* Classrooms (assembly)	1.85m ² /person
	* Cafeteria space (assembly)	1.20m ² /person
	* Laboratories (assembly)	4.60m ² /person
	* Offices (assembly)	9.30m ² /person
	* Mercantile (if needed)	3.70m ² /person
	(Basement, main)	3.70m ² /person
	(Other storeys)	5.60m ² /person
	* Storage	46m ² /person
6 Building Fire Safety		
6.1	Roof top equipment, stair or service room are not considered a storey in building height.	3.2.1.1.1)
6.2	Mezzanines not considered a storey.	3.2.1.1.4)
6.3	Exceptions to structural protection are outlined within this Article.	3.2.2.3
6.4	Crawl space is called a basement if clear height is more than 1.8m.	3.2.2.9
6.5	Every building shall face a street. 89 Avenue is considered a street under the Code while the roadway between Dentistry Pharmacy and Power Plant is not considered a street or access for this building.	3.2.2.10
6.6	Roof top enclosures shall be constructed as type of construction required.	3.2.2.14
6.7	Group A, Division 2, up to 6 storeys, Any Area, Sprinklered. Non-combustible construction sprinklered throughout. Floor assemblies fire separation with a fire resistance rating of 1hr., mezzanines 1hr, and loadbearing 1hr. Multiple floor systems exist within the building. Those systems that do not meet the 1 hour FRR separation requirements will have spray fire proofing.	3.2.2.24

Section	Description	Reference
6.8	Group D, up to 6 storeys, sprinklered, maximum floor area 7200 m ² Non-combustible construction sprinklered throughout. Floor assemblies fire separation with a FRR of 1hr., mezzanines 1hr, and load bearing 1hr. Multiple floor systems exist within the building. Those systems that do not meet the 1 hour FRR separation requirements will have spray fire proofing.	3.2.2.51
6.9	Group E, Any height, Any Area, Sprinklered. Non combustible construction sprinklered throughout floor assemblies fire separation with a fire resistance rating of 2hr, mezzanines 1hr, and load bearing 2hr. Floor systems do not meet 2 hour FRR separation and as such any group E occupancy can not exceed 10% of floor area it is on.	3.2.2.57 JL
6.10	NA	
6.11	Group F, Division 3, Any height, Any Area, Sprinklered. Non-combustible construction sprinklered throughout. Floor assemblies fire separation with a FRR of 1hr., mezzanines 1hr, and load bearing 1hr. Multiple floor systems exist within the building. Those systems that do not meet the 1 hour FRR separation requirements will have spray fire proofing.	3.2.2.73
7 Spatial Separation and Exposure Protection		
7.1	Area of unprotected openings in exposed building face for applicable limiting distance shall be as Table 3.2.3.1.C	3.2.3.1.1)
7.2	Area of unprotected openings . Table 3.2.3.1.C for Group A2, D, F3 Table 3.2.3.1.D for Group E, F2	Tables 3.2.3.1.C 3.2.3.1.D
7.3	Area of exposing building face is the area of a fire compartment formed by fire separations of fire resistance rating not less than 45min. Ref. to Diagram 7.3a and 7.3b	
7.4	Wall with openings with limiting distance less than 1.2m shall be protected by closures.	3.2.3.5
7.5	Combustible projections more than 1m above ground level not allowed if limiting distance is less than 1.2m	3.2.3.6
7.6	Construction and cladding of exposing building faces must meet Table 3.2.3.7	3.2.3.7
7.7	For A2, D, F3 unprotected openings of: 0-25% 1hr FRR non-combustible (0-10) or combustible (10-25) non combustible cladding. 20-50% 45 min. FRR combustible or non-combustible and cladding. Group E must be less than 10% of floor area.	Table 3.2.3.7
7.8	Street level facing a street with limiting distance of 9m may have unlimited unprotected openings.	3.2.3.10
7.9	An opening in an exit that could be exposed to an opening in building at an angle less than 135° must be protected. Protection of link exit at west face of DP will be added in design development.	3.2.3.13
7.10	Openings in separate fire compartments parallel or at an angle less than 135° do not need protection is building is sprinklered.	3.2.3.14
7.11	Wall exposed to an adjoining roof allows windows and openings in roof if building is sprinklered.	3.2.3.15
7.12	If buildings are connected by walkways each building must be separated by 45 FRR. Walkway must be non-combustible. Walkway can not exceed 9m in width. SAB link shall be separated from Dent Pharmacy by a 2 hr. FRR separation. Interconnected floor space vestibule is needed as well.	3.2.3.19 IGI email 2012/07/16
7.13	Underground walkway (link to SAB or LRT) must be separated from adjacent buildings by 1hr. FRR, be only used for pedestrian traffic, non combustible, have smoke barrier doors nor more than 100m.	3.2.3.20
8 Fire Alarm and Detection Systems		
8.1	Fire alarm system is required.	3.2.4.1.1)
8.2	Fire alarm required to both buildings if there is an opening in a firewall between buildings. Provide outline how UA fire alarm systems operate, and how that meets code. Include in outline spec.	3.2.4.2 DC

Section	Description	Reference
8.3	A single or two stage system allowed. UA uses single stage. Suggestion that now is the time to change to a 2 stage system.	3.2.4.3 DC
8.4	Description of fire alarm system.	3.2.4.4
8.5	Fire alarm verification required.	3.2.4.5
8.6	Silencing of alarm automatically not allowed for 20min and manual silencing switches only in fire control unit.	3.2.4.6
8.7	Fire alarm must notify fire department.	3.2.4.7
8.8	Annunciator required close to a building entrance on a street.	3.2.4.8.1)
8.9	Annunciator shall have separate zone indication.	3.2.4.8.2)
8.10	NA.	3.2.4.8.7)
8.11	Electrical supervision must be provided.	3.2.4.9
8.12	Fire detectors shall be connected to fire alarm system. Smoke detector at equipment.	3.2.4.10
8.13	Fire detector includes heat detectors and smoke detectors. Smoke detectors required in exit stairs shafts and at draft stops (3.2.8.7)	3.2.4.11
8.14	Air circulation systems that serve more than one storey, more than one suite on a floor area, or more than one fire compartment shall have duct-type smoke detectors to prevent circulation of smoke.	3.2.4.12
8.15	Does UA require central vacuum cleaning system. If so, must shut down on alarm.	3.2.4.13
8.16	Elevators with automatic emergency recall do need smoke detectors at all lobbies.	3.2.4.14
8.17	System monitoring of sprinklers activation is required and connected to fire alarm system. Zoning under NFPA 13 is required which includes 5000 SM maximum zone size.	3.2.4.15
8.18	Manual pull stations required at every principal entry and at every exit.	3.2.4.16
8.19	Audible signal devices can have alarm, alert and voice (including paging) but paging overridden by alarm, alert. No musak Visual alarms can be added. Mass notification is additional to FA, voice capable fire alarm sianalina is required.	3.2.4.17
8.20	Audible alarms must meet conditions.	3.2.4.18
8.21	Visual signal devices if used must be visible from all of floor area.	3.2.4.19
8.22	Voice communication system required if building is considered a high building. Building is not a high building.	3.2.4.21
9 Provisions for Firefighting		
9.1	Roof access to all main roof areas require direct access from floor area below by stairway or hatch or ladder Ref. to Diagram 9.1	3.2.5.3
9.2	Building requires access route for fire department vehicles to south face.	3.2.5.4
9.3	Front access to be between 3m and 15m from the access route. 89 Avenue is considered a street under the Code. Distance exceeding 15m has been accepted and a fire hydrant will need to be added on 89 Avenue.	3.2.5.5.1) IGI email 2012/07/16
9.4	Access allows pumper to be adjacent to hydrant and path of travel for firefighter from vehicle to building less than 45m.	3.2.5.5.2)
9.5	Access route meet requirements. Ref. to Diagram 9.5	3.2.5.6
9.6	Water supply is adequate.	3.2.5.7
9.7	Standpipe system is required.	3.2.5.8
9.8	Standpipe system to meet NFPA 14. A fire pump is required to meet pressures required.	3.2.5.9
9.9	Hose connections shall be located in exits. Hose connections are not needed in floor area. 65mm hose connection.	3.2.5.10
9.10	Hose station and cabinets not required in a sprinklered building.	3.2.5.11
9.11	All valves in standpipe system to electrically supervised.	3.2.5.12
9.12	Sprinkler system to be designed to NFPA 13.	3.2.5.13.1)
9.13	Sprinklers in elevator machine rooms to have temperature rating not less than intermediate temperature classification.	3.2.5.13.8)

Section	Description	Reference
9.14	In combustible construction sprinklers are required in attics, floor and ceiling spaces, and concealed spaces. Combustible joists, rafters, walls, and sheathing may have intumescent paint applied and a sprinkler system will be provided within attics.	IGI email 2012/07/16
9.15	Combustible sprinkler piping not allowed.	3.2.5.14
9.16	Each mechanical room must be separately annunciated in fire alarm panel.	3.2.5.15.2)
9.17	Fire department connections for standpipes no more than 45m to a hydrant. This also applies to sprinkler connections. Connections between 3m and 15m from principal entrance. Ref. to Diagram 9.5	3.2.5.16
9.18	Fire extinguisher to meet Alberta Fire Code and be in cabinets (comply to NFPA-10). Install every 75ft. travel distance in cabinets.	3.2.5.17.1)
9.19	Fire pump to meet NFPA 20 and have emergency power backup.	3.2.5.19
10 Additional Requirements for High Buildings		
10.1	High building for our uses is over 36m from grade to floor level of top storey. Under this we are not a High Building.	3.2.6.1
10.2	High building if over 18m from grade to floor level of top storey if total occupant load above first storey divided by 1.8 times the width of all exits stairs of that storey exceeds 300. Under this we are not a high building. Refer to Table 10.2	3.2.6.1
11 Lighting and Emergency Power Systems		
11.1	Exit, public corridor, or a corridor providing access to exit shall have lighting not less than 50lx at floor level.	3.2.7.1
11.2	Emergency lighting at not less than average 10lx at floor shall be provided in exits, principal routes to provide access to exit in open floor areas and service rooms, corridors used by public, public corridors, Group A2 areas over 60 people. Emergency lighting can be no less than 10lx.	3.2.7.3
11.3	Emergency power supply shall be provided to maintain emergency lighting by battery or generator for 30 minutes.	3.2.7.4
11.4	Fire alarm systems require emergency power supply by battery or generator and provide supervisory power for 24hr., and after that 30min.	
11.5	Emergency power for building services shall operate under full load for 2 hours for water supply for fighting, fans and electrical equipment needed to maintain air quality, and fans for venting under 3.2.8.	3.2.7.9
	All elevators (one at a time). UA requires elevators on EP.	DC RD
12 Mezzanines and Openings through Floor Assemblies		
12.1	Floor areas that do not terminate at an exterior wall shall terminate at a vertical fire separation with a 1hr FRR or conform to 3.2.8.3 - 9.	3.2.8.1
12.2	Building must be non-combustible.	3.2.8.3
12.3	Building must be sprinklered throughout.	3.2.8.4
12.4	An exit opening into an interconnected floor space shall be protected by a vestibule with doorways not less than 1.8m apart, is separated from remainder of floor area with a FRR (smoke separation), and is designed to limit passage of smoke so level of contamination in stair does not exceed limits of 3.2.6.2 (2). If an elevator opens into interconnected floor and floor levels above the interconnected floor area a vestibule is required to protect either doors in interconnected floor or those above. Vestibule as 3.2.8.5 (1).	3.2.8.5
12.5	A protected floor area may be used to satisfy 3.4.3.2 (6)(b). Separation to be 2hr and requires vestibules on openings as 3.2.8.5 (1). Extent of protected floor area required will be developed during design development or construction documentation and be included either in base building or tenant fit up.	3.2.8.6
12.6	A draft stop shall be provided at each floor level surrounding the opening and be 500mm deep. Close spaced sprinklers and smoke detectors required. We may want to discuss use of sidewall sprinklers in the atrium at lower levels in lieu of sprinklers at the top of the atrium. This will need further study and investigation.	3.2.8.7 BC / DC

Section	Description	Reference
12.7	A mechanical exhaust system shall be able to remove air from interconnected floor space at a rate of 4 air changes per hour. Operates by manual switch near entrance for firefighter access. Smoke evacuation of 4 air changes per hour for the entire building is excessive. A modified method needs to be discussed with AHJ.	3.2.8.8 BC / DC
12.8	Where ceiling height exceeds 8m limit of combustible contents is 16g/m ³ of volume of interconnected floor space. At this time all floor areas should be considered interconnected.	3.2.8.9 All
13 Safety within Floor Areas		
13.1	Suites in occupancies other than Group D require a fire separation with 1hr FRR from each other. Suite means a single room or series of rooms operated under a single tenancy. Classification as Group D is beneficial.	3.3.1.1
13.2	Storage, handling, and use of hazardous substance to conform to AFC 2006. Cooking to be Part 6. Also applies to flammable liquids and combustible liquids.	3.3.1.2
13.3	Access to exit shall conform to 3.3.1.3, 3.3.2 to 3.3.5	3.3.1.3
13.4	Roof requires access to exit if used for occupancy.	3.3.1.3.3)
13.5	A roof top enclosure shall be provided with an access to exit that leads to an exit at roof level or at level immediately below. If area of enclosure exceeds 200m ² then 2 means of egress are required.	3.3.1.3.5)6)
13.6	Each suite in a floor area requires a doorway into a public corridor.	3.3.1.3.8)
13.7	A point where egress in 13.6 occurs it shall be possible to go in opposite directions to 2 exits.	3.3.1.3.9)
13.8	No access to exit for an assembly occupancy may lead through a kitchen, service space, or storage room.	3.3.1.3.10)
13.9	A public corridor is required to be separated from remainder of storey by a fire separation.	3.3.1.4.1)
13.10	A storey that is sprinklered throughout no FRR is required for separation of public corridor.	3.3.1.4.3)
13.10.A	No fire separation is needed between a public corridor and the remainder of a storey provided travel distance from any part of floor area to an exit is not more than 45m.	
13.11	Two egress doors are required from a room or suite if occupancy load exceeds 60, in a sprinklered space travel distance to an egress exceeds 25m or the suite or room exceeds area of 200m ² (A2, E, F2), 300 m ² (D, F3)	3.3.1.5
13.12	If two egress points are required maximum travel distance in suite can not exceed that allowed in 3.4.2.5	3.3.1.6
13.13	Protection on floor areas with barrier free path of travel is provided by sprinklers.	3.3.1.7
13.14	Tactile warning strip is required in a barrier free path of travel at a downward change in elevation. 600mm wide 250mm from edge and full width of stair, ramp.	3.3.1.7.4)
13.15	Minimum headroom clearance in access to exit to be the same as exits. 3.4.3.4	3.3.1.8
13.16	Minimum width of public corridors is 1100mm.	3.3.1.9.1)
13.17	Obstructions located within 1980mm of floor can not project more than 100mm into corridor, if above 680mm.	3.3.1.9.3)4)
13.18	A dead end corridor can not be longer than 3m.	3.3.1.9.7)
13.19	Door shall swing on vertical axis if entering a corridor or from a room not in a suite. Door must swing in direction of travel if population exceeds 60.	3.3.1.11
13.20	Sliding doors can be used in place of swing doors in 3.3.1.11 if they break away in direction of travel.	3.3.1.12
13.21	Doors in path of egress must be operable without keys or special knowledge, door release hardware can only have action, and minimum door width is 800mm.	3.3.1.13
13.22	Stairs that are not exits must conform to dimensional, guard, handrail and slip-resistance of an exit stair.	3.3.1.14
13.23	Capacity of an access to egress based on occupancy load of floor area served.	3.3.1.17.1)
13.24	Access to exit ramps (less than 1 in 8, doorways, and corridors) have width based on 6.1mm/person.	3.3.1.17.2)
13.25	Width of a ramp over 1 in 8 shall be based in 9.2mm/person.	3.3.1.17.3)
13.26	Capacity of stairs in access to exits shall conform to 3.4.3.2	3.3.1.17.5)

Section	Description	Reference
13.27	Guards 1070mm high are required around openings into smoke shafts, at raised floors, galleries where difference in level is more than 600mm. Guard will prevent 100mm sphere passage, guard will not have climbable surfaces between 140 and 900mm above floor. (Front edge of loading dock does not need a guard).	3.3.1.18
13.28	Transparent doors and panels must be readily apparent, glass shall be laminated, tempered, or wired. Panels shall not be mistaken for doors.	3.3.1.19
13.29	NA	3.3.1.20
13.30	Janitor rooms separation does not require a FRR.	3.3.1.21
13.31	No obstructions that make means of egress less than 750mm allowed.	3.3.1.23
13.32	Storage room larger than 1m ² in an assembly occupancy must have a fire separation with FRR of 1hr.	3.3.1.26
13.33	Non fixed seating in assembly occupancy must meet AFC.	3.3.2.3
13.34	Fixed seating, aisles, libraries. Council Chambers and classroom will need to meet 3.3.2.4 and 3.3.2.5 for configuration of seats and aisles.	3.3.2.4
14 Exits		
14.1	Exits include exterior doorway, interior passageway, stair.	3.4.1.4
14.2	Horizontal exits do not exist.	3.4.1.6
14.3	Every floor area must be served at least 2 exits. Travel distance from a suite can be measured from the egress door if it enters a corridor through fire separation with no FRR.	3.4.2.1
14.4	Exits shall be located so travel distance does not exceed 45m in a sprinklered building and are clearly identified and accessible at all times.	3.4.2.5
14.5	Exits must have width to accommodate occupant load.	3.4.3.1
14.6	Required width of exits is occupant load by 6.1mm/person for ramps less than 1 in 8, doorways, and corridors; 8mm/person for stairs with rise not more than 180mm and run not less than 280mm; and 9.2mm for ramps over 1 in 8 and stairs not as above. Ref. to Table 14.6 and Diagram 14.6a - 14.6i	3.4.3.2.1)
14.7	Required exit width need not be cumulative if an exit serves floors above each other.	3.4.3.2.4)
14.8	Stair serving interconnected floor spaces need to be cumulative unless stairs provide 0.3m ² of area of landings and treads for each occupant of interconnected floor or use of protected floor space of 0.5m ² on each floor area. Ref. to Diagram 14.8 Extent of protected floor area required will be developed during design development or construction documentation and be included either in base building or tenant fit up.	3.4.3.2.6)
14.9	For multiple exits no single exit can accommodate more than half of required exit.	3.4.3.2.7)
14.10	Minimum width of exit is 1100mm for corridors, 1100mm for stairs, and 800mm for doorways.	3.4.3.2.8)
14.11	Nothing can be fixed within an exit to reduce exit width. Swinging doors shall not reduce width of exit stairs or landing to less than 750mm, or reduce width of corridor to less than required width, and handrails and construction below handrails can not reduce width more than 100mm on each side.	3.4.3.3
14.12	Headroom clearance of an exit (and access to exit) no less than 2100mm except doors at 2030mm and closers at 1980mm.	3.4.3.4
14.13	Exit shall have a fire separation with a 1hr. FRR.	3.4.4.1
14.14	Not more than exit one is permitted to lead through a lobby provided lobby not more than 4.5m above grade; path of travel through lobby is less than 15m; can not be located in an interconnected floor space; and lobby conforms to requirements of an exit except rooms other than service rooms are permitted to open onto lobby, fire separations to rooms adjacent needs no FRR if sprinklered and 2hr FRR separation is needed between exit and lobby North central stair will need to extend to exterior or we will need to create lobby to be finalized in design development JL	3.4.4.2
14.15	Fire separation that separates an exit from building shall have no openings except for standpipe and sprinkler piping, electrical wires that only serve stairway, openings 3.2.6, exit doors.	3.4.4.4.1)
14.16	Fuel-fired appliance not allowed in an exit.	3.4.4.4.4)
14.17	Exit shall not be used as a plenum.	3.4.4.4.5)
14.18	Exit can only be used for exiting but can be used for access.	3.4.4.4.6)

Section	Description	Reference
14.19	A service room can not open directly into a exit.	3.4.4.4.7)
14.20	Washrooms, storage rooms or other ancillary rooms can not open directly into an exit.	3.4.4.4.8)
14.21	Every exit door must have an exit sign placed over it or adjacent to it, be visible from exit approach, be illuminated, say EXIT in red, 114mm high, 19mm strike, or in white 150mm high, 19mm strike, illumination on emergency	3.4.5.1
14.22	Stairs, ramps, landing, treads shall have slip resistant finish and shall have colour contrast at edge of tread and landing and top and bottom of ramp.	3.4.6.1
14.23	Minimum number of risers in a flight of interior stairs is 3.	3.4.6.2
14.24	Maximum rise of stairs is 3.7m between floors or landings. Width of a landing must be at least equal to width of stair except in a straight run need not be more than 1100mm.	3.4.6.3
14.25	Handrails needed in both sides of stairs if 1100mm or more in width. If width is over 2200mm than intermediate handrails no more than 1650 between is required.	3.4.6.4.1)2)
14.26	Handrails will be continuously graspable and have a circular cross section between 30 and 43mm or circular cross section with perimeter of 100 to 125mm and largest dimension is 45mm.	3.4.6.4.3)
14.27	Handrails to be not less than 865mm and not more than 965mm measured at nosing.	3.4.6.4.4)
14.28	At least one (1) handrail to be continuous through the length of stairs including landings.	3.4.6.4.5)
14.29	At least one (1) handrail at the side of the stair or ramp shall extend not less than 300 beyond top and bottom of stairway.	3.4.6.4.7)
14.30	Clearance from handrail to wall can be no less than 50mm or 60mm if wall surface is rough.	3.4.6.4.8)
14.31	Loading values on handrails of 0.9kn point load or 0.7kn uniform load.	3.4.6.4.9)
14.32	Guard required in exit stairs to be 920mm from nosing and 1070mm in landing and 1070mm for ramps. 100mm sphere passage must be prevented. Nothing between 140 and 900mm that facilitates climbing. Windows in stairs below 1070mm on landings require a guard or below 900mm above nosing. Guards meet loading under 4.1.5.15 and 4.1.5.17.	3.4.6.5
14.33	Ramp slope to have maximum slope of 1 in 10 (A2), 1 in 6 (E, F), 1 in 8 others. (See also barrier free)	3.4.6.6
14.34	Treads and risers : run not less than 280mm : rise between 125 and 180mm : rise and run shall be uniform : leading edge have radius or bevel between 6 and 10mm Existing stairs can be retained in their current condition: FRR of enclosure of 1 hr. will be provided.	3.4.6.7 IGI email 2012/07/16
14.35	Doors minimum distance from a stair riser and a leading edge of door swing shall not be less than 300mm. Minimum width of a door leaf is 610 if there is more than 1 leaf.	3.4.6.10
14.36	Every exit door shall swing on vertical axis and swing in direction of travel.	3.4.6.11
14.37	Exit doors must be on closers and can not have hold opens.	3.4.6.12
14.38	Door release hardware. Exit doors and principal entrance locking and latching to be opened in one action without knowledge. Panic hardware required on latching doors exit doors to exterior and from exit to a lobby. Electromagnetic locks are allowed under conditions.	3.4.6.15
14.39	Emergency access to floor areas is required if building is more than 6 storeys in height. Passage out of exit required into floor area must be available so travel distance up or down to an unlocked doors is not more than 2 storeys.	3.4.6.17
14.40	Floor numbering is required in all exits stairs, latch side, 60mm high, raised 0.7mm, 1350 AFF and 150 from door.	3.4.6.18
14.41	New exit stairs are needed on levels 5, 6 and 7 of the north wing. Refer to Table 14.6	
15 Vertical Transportation		
15.1	Elevators shall meet regulations under SCA and meet AEDARSA inspection, and CSA B44	3.5.2.1
15.2	Hoist ways for elevators to be a fire separation with a 2hr FRR.	3.5.3.1.1)
15.3	Passenger elevators (not fire fighters) are allowed to be located in an interconnected floor space without being enclosed from the remainder of building except elevator machine room is located in a room with a fire separation with 2hr FRR.	3.5.3.1.2)
15.4	Elevator machine room needs to be separated from remainder of building by fire separation of 2hr FRR.	3.5.3.3

Section	Description	Reference
15.5	At least one car shall have interior dimensions to accommodate and provide access for a stretcher. 1134Kg car with interior dimensions of 2032mm wide and 1295mm deep with right or left hand access door (1067mm) on long side or 915mm door on short side.	3.5.4.1
15.6	Floor numbers to be mounted on both jams of hoistway entrance (CSA B44).	3.5.4.2
16 Service Facilities		
16.1	Service rooms are not to be used for storage.	3.6.1.3
16.2	Fuel fired appliances installed on roof or outside building shall be 1.2m from property line and 3m from wall in building with a window within 3 storeys above and 5m horizontally.	3.6.1.4
16.3	Fire separations for service rooms: * 1hr FRR in rooms housing fuel fired appliances. (We have no fuel fired appliances) * electrical equipment required to be in a service room under electrical regulations shall be separated from remainder of building by a 1hr FRR separation. * all other service rooms in a sprinklered building shall have a separation.	3.6.2.5
16.4	Combustible refuse storage room must be separated from remainder of building by fire separation with 1hr FRR.	3.6.2.5
16.5	Electrical vaults if required by electrical regulations must comply with 3hr FRR fire separation from remainder of building if not sprinklered, 2hr FRR if sprinklered (walls, structure over to be concrete or masonry). Only ducts, fire protection necessary for operation can penetrate fire separation. Explosion relief required if liquid filled. Vault shall have ventilation system to maintain temperature below 40°C. System is separate from remainder of building system and shut down if fire in the vault.	3.6.2.8
16.6	Emergency generator if in a room is separated from remainder of building by fire separation with 2hr FRR. Only generating set and related equipment allowed in room.	3.6.3.1
16.7	Vertical service spaces shall be separated from adjacent storey by a fire separation having a 1hr FRR. Must terminate at roof or lowest floor or have a 1hr FRR top or bottom. Only openings necessary for use of shaft are allowed.	3.6.4.1
16.8	If shaft contains an exhaust duct that serves more than 1 fire compartment exhaust fan to be near outlet so duct is under negative pressures. Confirm this will be done.	BC
16.9	Horizontal service spaces include ceiling spaces, duct spaces, and attic or roof spaces.	3.6.4.1
16.10	Horizontal service space that penetrates a vertical fire separation it must be separated from space below by a separation with a FRR equal to shaft or 30 min if shaft is 45min.	3.6.4.3
16.11	Using ceiling or roof space as a plenum is allowed if space does not have materials with FS over 25 or SD over 50. Will we use ceilings as plenums. If so control of space is needed.	BC / DC
16.12	Attic with space over 900mm high must have access hatch from below of at least 550mm x 900mm or by a stairway.	3.6.4.4
16.13	Horizontal service spaces over 1200mm high and 600mm wide require inspection doors 300mm square so entire interior space can be viewed.	3.6.4.7
16.14	Roof requires direct access by stair if roof is over 4m above grade. Review all roof areas to ensure we have stair access to all.	JL
16.15	All ducts are to be non combustible material. Duct sealants shall have FS less than 25 and SD less than 50.	3.6.5.1
16.16	Vibration isolation connectors shall be non combustible but some combustible connections are allowed with conditions.	3.6.5.2
16.17	Coverings, linings, insulation non combustible of heat is 120°C or more and if combustible FS less than 25 SD less than 50.	3.6.5.4
16.18	Combustible grilles for ventilation shall have FS and SD no more than requirements for surfaces they are in.	3.6.5.5
16.19	Return air ducts can be combustible but will not be used.	3.6.5.8

Section	Description	Reference
17 Barrier Free Design		
17.1	Building is required to be barrier free and must comply with all requirements.	3.8.1.1
17.2	At least 50% of entrance to building must be barrier free.	3.8.1.2
17.3	Unobstructed barrier free path is minimum 920mm and any change over 13mm in elevation will be by floor slope or ramp. Barrier free path over 30m in length will have width increase to 1500 wide and 1500 long at intervals not exceeding 30m.	3.8.1.3
17.4	Controls must be operable by one hand and mounted between 400 and 1200mm above floor.	3.8.1.5
17.5	Barrier free path to be provided to all normally occupied floor areas. Barrier free path for persons using wheel chairs not required for service rooms, janitor rooms, to floor not served by elevators.	3.8.2.1
17.6	Washrooms in barrier free path should be barrier free. Barrier free stalls minimum of 1 per 10 stalls or part thereof.	3.8.2.3
17.7	Accessibility signage is required. Is signage by UA or in tender.	3.8.3.1 LL
17.8	Sidewalks providing barrier free access shall be minimum 1100 wide, cross slope less than 1:50, have level area (1500x1500 min) at door, have a 75mm curb if there is 75mm or larger drop adjacent and there is no wall or railing and be designed as a ramp where slope exceeds 1 in 20.	3.8.3.2
17.9	Minimum clear width of doorway in barrier free path is 800mm, doors have lever handlers, all entrance that are barrier free should have power door operator. Closer operation, force to open door requirements set.	3.8.3.3.10)
17.10	Doors not equipped with power door operator shall have 600mm clearance on latch side if door opens toward approach and 300 if away from approach.	3.8.3.4
17.11	Ramps in barrier free not more than 1 in 12 be level at top and bottom of at least 1500 x 1500. Ramp requires flat landing no more than 9m apart. If slope is steeper than 1 in 20 than is considered a ramp.	3.8.3.6
17.12	Barrier free seating is required in seating areas.	3.8.3.7
17.13	Assistive Listening Device are required in assembly occupancy areas over 100m ²	3.8.3.8
17.14	Water closets that are barrier free shall be located in an enclosure meeting these item. See also BF Guidelines.	3.8.3.9
17.15	Urinals (barrier free) shall meet this item. See also BF Guidelines.	3.8.3.10
17.16	Lavatories in barrier free washrooms should meet requirements of this item. See also BF Guidelines.	3.8.3.11
17.17	Universal toilet room shall meet requirements of this item. See also BF Guidelines.	3.8.3.12
17.18	If showers are provided one shall be barrier free and meet this requirements.	3.8.3.13
17.19	Counters shall have a barrier free section if over 2m in length.	3.8.3.14
17.20	Public telephones need to be barrier free.	3.8.3.15
18 Structural Design		
18.1	Dead load of existing building has been determined by inspection of existing drawing details and on site measurement to confirm materials and depth of structure. This is an on-going process as we undertake a program of intrusive survey work. A load of 1.0KN/m ² for future partitions has been provided where appropriate.	4.1.4.1
18.2	Live loads have been specified to correlate with the occupancy of the building as office areas or classrooms.	4.1.5.1
18.3	Following evaluation, there is not a change in use of the building, damage or deterioration or safety concerns because of defects that would require a structural evaluation.	Commentary L Section 6.0
18.4	Based on Table L-1 as there are no changes in use or occupancy loads, the Code/standard when built will be used for Loads and Material Standards. Existing structure can be used. Commentary L guidelines are followed.	Commentary L Section 15.0 IGI email 2012/07/16
18.5	The structural components of the building were designed prior to the benchmark version of the codes listed in Table L-2. The evaluation will be based satisfactory past performance under the conditions of Paragraph 18	Commentary L Section 17.0

Section	Description	Reference
18.6	Section 18 Compliance criteria:	
	a. The building has been examined by a professional engineer and there is no evidence of significant damage, distress or deterioration.	Commentary L Section 18.0
	b. The structural system is reviewed, including examination of critical details and checking them for load transfer.	Commentary L Section 18.0
	On-going process based on site surveys undertaken to date, intrusive site survey due for completion on 1st June 2012 and observation during construction.	RT
	c. The building dates back to 1922 and has demonstrated satisfactory performance for more than 30 years.	Commentary L Section 18.0
	d. Following a review of the historical use of the building and the existing building drawings dating back to 1922, there have been no changes within the past 30 years that could significantly increase the loads on the building or affect its durability, and no such changes are contemplated during our works.	Commentary L Section 18.0
19 Environmental Separation		
19.1	This part is concerned with control of condensation and transfer of heat, air, moisture, and sound.	5.1.1.1
19.2	Building shall be designed to accommodate structural and environmental loads.	5.1.4.1
19.3	Building shall be designed to resist deterioration.	5.1.4.2
19.4	Building shall be designed to meet environmental loads and design procedures.	5.2.1
19.5	Building shall be designed to meet structural loads.	5.2.2
19.6	Building shall be designed to resist heat transfer.	5.3.1
19.7	Air barrier system shall be provided.	5.4.1
19.8	Vapour barrier shall be provided.	5.5.1
19.9	Building shall be protected from precipitation.	5.6.1
19.10	Building shall be protected from surface water.	5.7.1
19.11	Building shall be protected from moisture in ground.	5.8.1
20 Heating, Ventilation and Air-conditioner		
20.1	Exit Stairway HVAC: Do not use common air systems to heat/cool/ventilate exit stairways on buildings more than 1 storey.	6.2.1.12.1)
20.2	Required Ventilation: Outdoor air ventilation rates shall not be less than that prescribed in ASHRAE 62.	6.2.2.1.2)
20.3	NA	6.2.2.6
20.4	Crawl Spaces and Attic or Roof Spaces: Attics must be ventilated by natural or mechanical means.	6.2.2.7.1)
20.5	Fire Dampers: Conform to Article 3.1.8.9.	6.2.3.6.1)
21 Plumbing Services and Health		
21.1	Floor drains are required in washrooms equipped with an automatic flushing device.	7.2.1.4
21.2	Water closets determined by occupancy loads under 3.1.17.1 except business and personal services occupancies which can use 14m ² / person and equal men and women. Urinals can be substituted for 2/3 of number of water closets	7.2.2.1
21.3	Fixture requirements: 1 for 25 females, 1 for 35 males for dining rooms, restaurants and serving alcohol. This will be defined by final use (400 for atrium)	7.2.2.5 LL / JL
21.4	Fixture requirements for assembly occupancies shall be as required by this sentence. This will be defined by final use (existing wall area based)	LL / JL
21.5	Fixture requirements for mercantile occupancies shall be 1 for 300 males and 1 for 150 females. This will be defined by final use. The above three items will need to be studied for main floor uses (atrium).	7.2.2.8 LL / JL
21.6	Fixture requirements shall be as this sentence for business and personal occupancies. Ref. to Table 21.6	7.2.2.9
21.7	Lavatories required as follows: 1 for first two fixtures and then 1 for each additional 2 fixture.	7.2.4.1
21.8	Food establishments shall meet requirements of this section.	7.5.1
21.9	Laboratories using biological agents shall be designed to suit Laboratory Biosafety Guidelines. Does SLOWPOKE require this.	7.9.1 BC

- SLOWPOKE Report

**UNIVERSITY OF ALBERTA
SLOWPOKE REACTOR FACILITY**

OFFICIALLY OPENED

22. APRIL, 1978

BY

E. A. GEDDES

CHAIRMAN OF

THE BOARD OF GOVERNORS

H. E. GUNNING

PRESIDENT

M. J. HUSTON

DEAN OF PHARMACY

Dentistry Pharmacy
Building Redevelopment
SLOWPOKE Plan

DRAFT - September 11, 2012



Acknowledgements

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INTRODUCTION

Context

The scope of the Dentistry Pharmacy Building Redevelopment project encompasses the renovation of the entire Dentistry Pharmacy building which will convert the existing use from an academic medical sciences building containing classrooms and laboratories to an administration function containing new office and related support functions. The proposed renovation involves the addition of new Atrium functions and an enclosure to make the existing two courtyards into one space by removal of the Centre wing and the installation of new Atrium structure and building envelope to make this an interior space.

The SLOWPOKE Facility, situated within the Dentistry Pharmacy building, including its Reactor Vault which resides beneath what will be the new Atrium's floor, is intended to continue operating during and after the redevelopment of the Dentistry Pharmacy project is complete. This plan has been developed to define the course of action required to negotiate the transition from the existing Facility's situation to a fully integrated SLOWPOKE Facility in the newly redeveloped Dentistry Pharmacy Building.

Consultation w/U of A SLOWPOKE Representatives

Consultation with Dr. John Duke and Carl Schumaker and other U of A representatives took place during the Spring and Summer of 2012 to identify the requirements for continued operation and potential decommissioning/re-fueling procedures of the facility. A preliminary workplan was generated and formed the basis of approach for developing this more detailed plan for the redevelopment schematic design.

DPBR Scope and Anticipated Construction Phasing

The Dentistry Pharmacy Building Redevelopment project will involve several phases of construction with the protection of the SLOWPOKE facility identified as Phase 1 of the project.

The SLOWPOKE Facility Program - Architectural

Currently the SLOWPOKE facility includes the Reactor Vault at the basement Level beneath the West courtyard, two labs at Level 1 directly south of the West Courtyard that are connected via a single stairwell to the Vault, three offices located in the SAB link and a storage room on Level 1 in the Dentistry Pharmacy building.

SLOWPOKE - Structural

Structural modifications to the SLOWPOKE Facility will be limited to the installation of a new corridor to the East of the SLOWPOKE Reactor Vault. A new opening at the base of the existing stair is required to make the new connection to the relocated Labs in the basement. Other structural discussion in this report will revolve around construction activities adjacent the SLOWPOKE reactor and the decommissioning plan for removal and/or re-fueling of the reactor core assembly and how the design will address this.

SLOWPOKE Systems

SLOWPOKE General Mechanical Design

The existing mechanical systems in the Dentistry Pharmacy Building will be removed in their entirety and replaced with new systems.

During the building renovation, the SLOWPOKE Reactor will remain as a fully functional lab, 24/7/365 throughout all phases of construction. Other than the SLOWPOKE Reactor and associated facilities, the building will be off-line with existing equipment being removed to allow for new mechanical systems to be installed.

Specifically for the SLOWPOKE reactor mechanical systems, there will be two phases of construction. Phase one involves the installation of temporary and independent mechanical systems and services to support the SLOWPOKE space and associated facilities through construction. Phase two involves the installation of the permanent standalone mechanical systems and services for the SLOWPOKE.

SLOWPOKE Codes and Standards for Mechanical

Requirements from the following codes and standards will be incorporated into the SLOWPOKE mechanical design.

- CNSC guidelines (GD-52)
- Alberta Building Code
- U of A Facilities and Operations Design Guidelines
- ASHRAE Standard and Guidelines
 - Standard 62 – 2007: Ventilation for Acceptable Indoor Air Quality.
- NFPA 13 – Installation of Automatic Wet Sprinkler System

SLOWPOKE General Electrical Design

The existing electrical systems in the Dentistry Pharmacy Building will be removed in their entirety and replaced with new systems.

During the building renovation, the SLOWPOKE Reactor will remain as a fully functional lab, 24/7/365 throughout all phases of construction. Other than the SLOWPOKE Reactor and associated facilities, the building will be off-line with existing equipment being removed to allow for new electrical systems to be installed.

Specifically for the SLOWPOKE reactor electrical systems, there will be two phases of construction. Phase one involves the installation of temporary and independent electrical systems and services to support the SLOWPOKE space and associated facilities through construction. Phase two involves the installation of the permanent standalone electrical systems and services for the SLOWPOKE.

SLOWPOKE Codes and Standards for Electrical

Requirements from the following codes and standards will be incorporated into the SLOWPOKE electrical design.

- CNSC guidelines (GD-52)
- Alberta Building Code
- U of A Facilities and Operations Design Guidelines
- CAN UL S524 Fire Alarm System
- Canadian Electrical Code CEC.

2. SUMMARY OF CHALLENGES

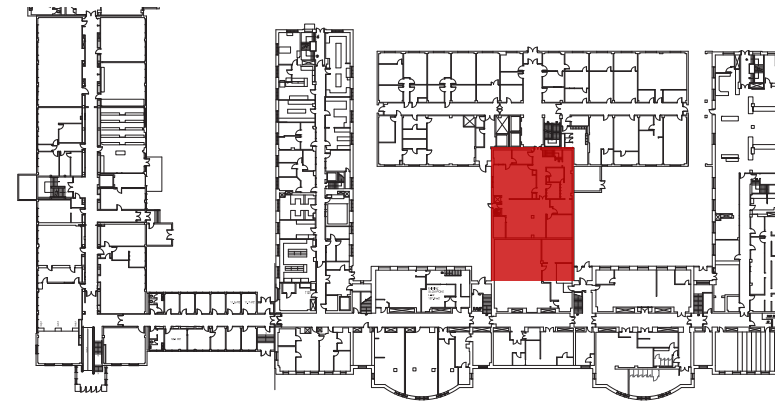
1. Protection of SLOWPOKE/Continued Operation during Construction

It is intended that the facility remain in operation throughout the duration of the larger Dentistry Pharmacy Redevelopment Project (DPBR), as such certain measures must be taken to isolate and protect the facility from the construction activity and allow it to be fully functional for the duration of the DPBR. These measures will include:

- Provide and maintain *secure separation* of the SLOWPOKE Facility from the construction zone and from the exterior of the building that may be compromised by activities caused by construction.
- Access to the Facility and between the Offices, Labs and Vault must be maintained throughout the duration of construction
- Provision of *life safety* systems including egress and exiting from the facility, fire protection, emergency lighting, etc.
- Maintain a dedicated route for *isotope delivery* from the Facility to the exterior of the building for pick-up by end-users.
- Protection and maintenance of the existing *24hr a day monitoring* system for the reactor.
- Provide *standalone* and *secure mechanical and electrical* services to the SLOWPOKE Vault and Labs that will not be unintentionally interrupted by construction activity.
- Maintain at a minimum the existing facilities *functional program* consisting of the *Reactor Vault*, *dedicated SLOWPOKE labs*, *offices*, *storage space* and if operating in an isolated condition *washroom facilities*.

2. Construction Activities adjacent SLOWPOKE Centre Wing Demolition

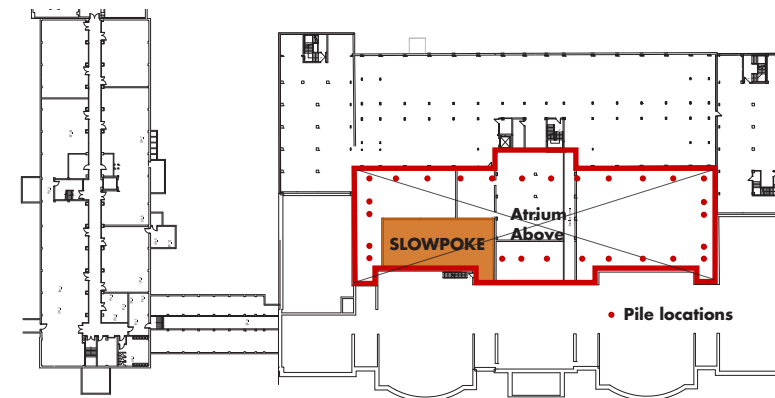
The Atrium redevelopment will require the demolition of the Centre Wing which was built in stages between 1922 and 1958 and shares a foundation wall with the SLOWPOKE Reactor Vault constructed at a later date in 1977. The shared foundation wall and the ground floor slab of the Centre Wing will remain in place and no part of the Reactor Vault will be modified as part of this demolition activity, although the superstructure of the Centre Wing above grade level will be entirely removed in a selectively demolished manner. This selective demolition must be conducted carefully to avoid undue vibration with no effect on the structural integrity of the Vault or the Reactor pool.



Centre Wing Demolition

Atrium Structure

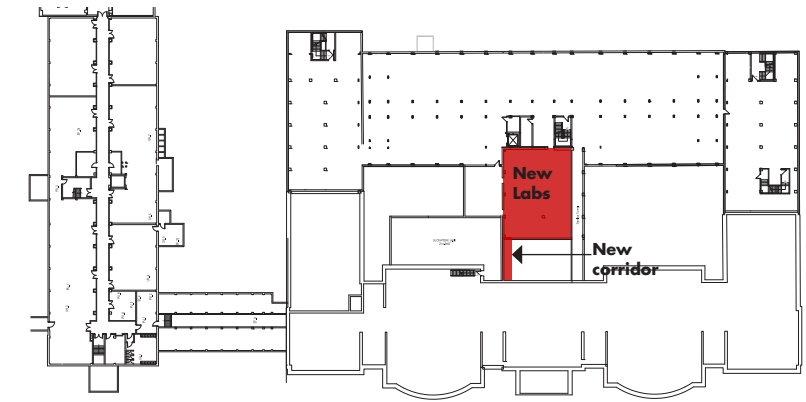
The new enclosure that will house the volume of the two courtyards and the area created by the demolition of the Centre Wing will involve the installation of a new structural framework to support the new program areas in the Atrium as well as the roof structure and glazing system that make up the building envelope. The Atrium structure will be founded on bored piles, approximate locations of the piles are indicated below.



New Atrium Structure Pile Locations - Basement Plan

Lab Corridor

One of the requirements for a redeveloped SLOWPOKE facility is to maintain the connection between the Reactor Vault and the SLOWPOKE lab space. Currently that connection is made via a stair that travels from the Level 1 labs directly down into the basement Vault. In the reconfigured lab location the labs will be located in the basement to the North-East of the Reactor Vault and the Offices will occupy the vacated lab space on Level 1. It is proposed that a new corridor connection be created in the basement from the Reactor Vault to the new Labs that would pass through the foundation wall at the base of the existing Reactor Vault stairs and then travel North to reach the labs - see figure below. Currently there is a 4'x4' service tunnel that runs parallel to the Eastern Reactor Vault wall that can be excavated to make room for the new corridor connection. The corridor construction would take place during the Phase 3 work of the Atrium.



New Lab Corridor Location - Basement Plan

Level 1 Floor Slab Installation

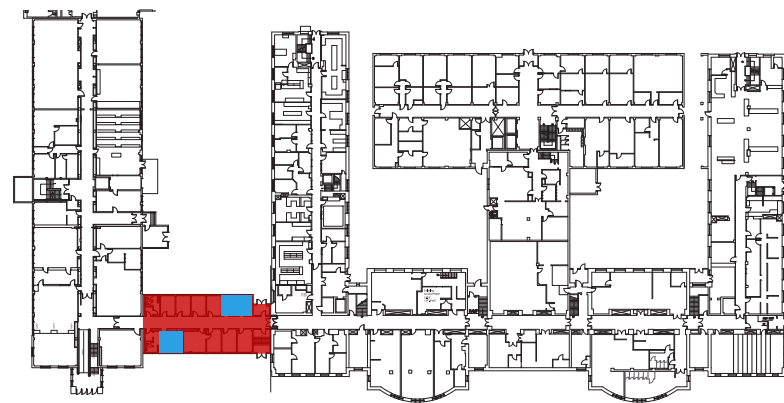
In addition to the corridor construction a new Level 1 slab will need to be installed to bring the floor level of the existing mechanical room directly to the East of the Reactor Vault up to align with the Level 1 floor slab. Originally the mechanical room slab was depressed to provide additional height for equipment. Some Mechanical and Electrical SLOWPOKE services will be run beneath this new floor.



New Floor Slab Location - Level 1 Plan

SAB Link Phasing

An additional redevelopment project that may coincide with the DPBR is the removal and reconstruction of the link that connects the South Academic Building (SAB) and the Dentistry Pharmacy Building (DPB). At present the SLOWPOKE faculty and staff offices are located in the SAB link and if the link redevelopment occurs before the construction of the new offices in DPB then interim accommodation will need to be made for the offices, storage and washroom facilities that currently support the facility and its users.



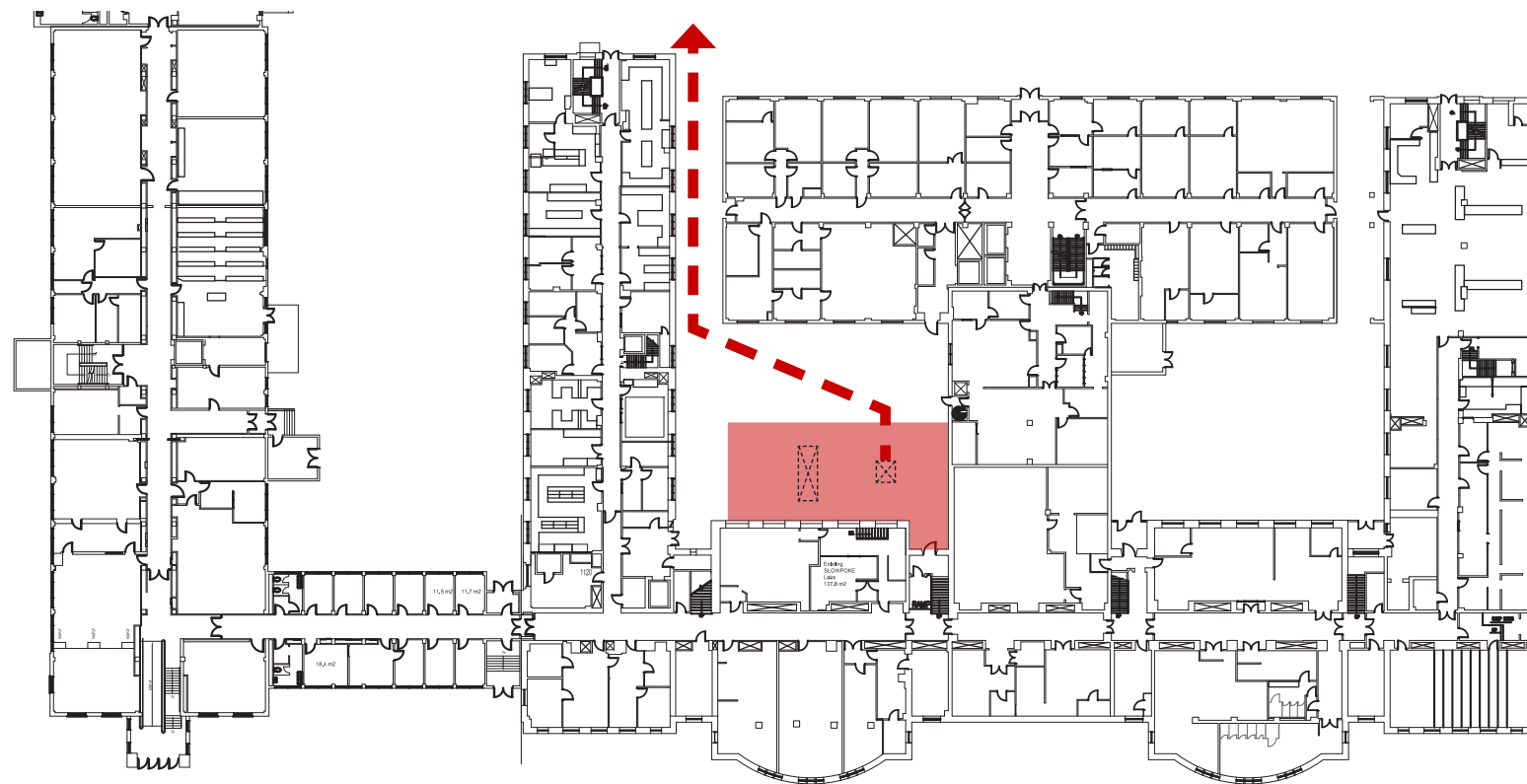
SLOWPOKE Offices in SAB Link - Level 1 Plan

3. Decommissioning Reactor Core removal

The procedure for the removal of the reactor core and its support assemblies is understood to be achieved by the removal of two hatches in the roof slab of the Reactor Vault.

The existing outdoor courtyard ground surface is covered with asphalt paving and over the Reactor Vault pre-cast paving stones sitting on a sand bed protect rigid insulation and a waterproofing membrane that maintains a weatherproof barrier for the Vault. Once the DPBR is complete the area directly above the Vault will no longer be exterior space currently accessible through a breezeway at the North-West corner of the building as it will then be enclosed interior Atrium space. In addition the asphalt and paving stones will give way to interior architectural floor finishes.

The new design must incorporate the ability to access and remove the hatches and the removal of the reactor core and related components for decommissioning and/or re-fueling to take place.



Current Decommissioning Route

3. SLOWPOKE FACILITY CURRENT OPERATIONS

Architectural

Program Area

Currently the SLOWPOKE facility operates within three distinct locations comprised of the Reactor Vault in the basement of the Dentistry Pharmacy Building (DPB), two dedicated labs on Level 1 (Ground Floor) and supporting office space located in the SAB link also on Level 1. In addition to these primary functions there is a storage room located on Level 1 in Rm. 1-012 of the DPB. Approximate areas of these spaces is as follows:

Reactor Vault	214.5m ²
Labs	137.8m ²
Offices	41.6m ²
Storage	37.8m ²

Isotope delivery

An important operational component of the facility is the transport of isotopes from the reactor pool to the building exterior. Isotopes are extracted from the reactor core and delivered via pneumatic tubes up into the Level 1 lab area and to the exterior of the building through an existing opening in a lab window. The isotopes are transferred into a storage receptacle in a waiting delivery vehicle that can access the east courtyard from the service road directly to the North of DPB.

Reactor Core Removal

The SLOWPOKE Reactor Vault has two removable pre-cast concrete hatches located in the roof of the Vault that are directly accessible from the West Courtyard. Asphalt pavers, sand and rigid insulation cover a roofing membrane protecting the SLOWPOKE Vault from the exterior environment.

Mechanical Current Operation

EXISTING SLOWPOKE UTILITIES

In the SLOWPOKE Reactor space

- Compressed Air (generated from the central plant)
- Controls for monitoring the SLOWPOKE (connected to the RCMS)
- Domestic Cold Water
- Sanitary System
- Ventilation Supply Air (generated by a dedicated supply air fan)
- Ventilation Supply Air Heat (generated by the base building glycol heating coils and a dedicated electric heating coil)
- Room Exhaust Air (generated by a dedicated roof mounted exhaust fan)
- Nuclear Exhaust Air (generated by a dedicated roof mounted exhaust fan interconnected to the lab fume hood exhaust system)

In the SLOWPOKE Lab space

- Compressed Air (generated from the central plant)
- Natural Gas (generated from the central plant, used for fume hoods in lab space)
- Controls for monitoring the SLOWPOKE (connected to the RCMS)
- Domestic Cold & Hot Water
- Distilled Water
- Sanitary System
- Space Heating (through hydronic perimeter baseboard fin radiation)
- Space Cooling (through electric air conditioning units mounted in the window)
- Ventilation Supply Air (generated by the general base building supply air fan)

- Ventilation Supply Air Heat (generated by the base building glycol heating coils)
- Nuclear Exhaust Air (generated by a dedicated roof mounted exhaust fan interconnected to the reactor pool exhaust system)

CURRENT SLOWPOKE VENTILATION SYSTEM

Ventilation of the SLOWPOKE reactor room is provided by a dedicated supply fan system utilizing the general base building glycol heating coils and filtration media. The existing office and lab space ventilation is provided by the general base building ventilation system located in the 1922 mechanical room.

CURRENT SLOWPOKE EXHAUST SYSTEM

There are two existing exhaust systems serving the SLOWPOKE reactor spaces, a general reactor room exhaust and a nuclear exhaust for the reactor pool and fume hoods. Both exhaust systems currently have independent exhaust fans located on the roof.

CURRENT SLOWPOKE HEATING SYSTEM

Space heating of the existing SLOWPOKE reactor space is provided by an air side electric heating coil. Space heating of the existing SLOWPOKE lab and offices is provided by the general base building hydronic heating system utilizing perimeter baseboard fin radiation.

CURRENT SLOWPOKE COOLING SYSTEM

Space cooling for the existing SLOWPOKE lab space is provided by electric window mounted air conditioning units. Cooling is not currently provided for the SLOWPOKE reactor space.

CURRENT SLOWPOKE SUPPORT SERVICES

Existing domestic cold and hot water serving the SLOWPOKE reactor and laboratory spaces are supplied from the general base building mechanical systems within the building.

Existing distilled water serving the SLOWPOKE laboratory space is supplied from the general base building mechanical system within the building.

Existing utility supplied natural gas and compressed air is extended from the campus utilities service tunnel to serve both the SLOWPOKE reactor and laboratory spaces.

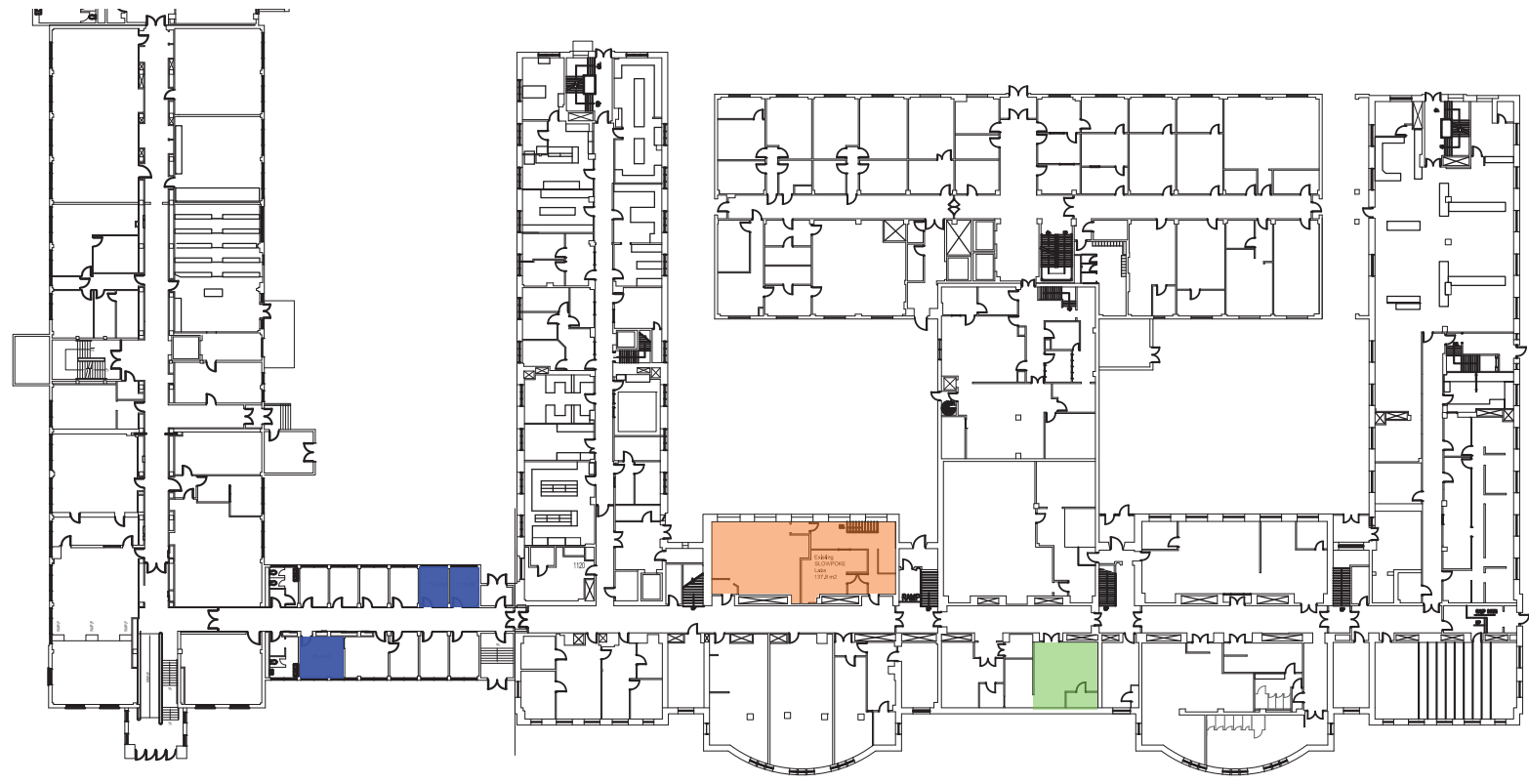
An existing sanitary sump pit serves the reactor pool which connects to a general base building sanitary system.

Electrical Current Operation

CURRENT SLOWPOKE UTILITIES

The existing slow poke services include:

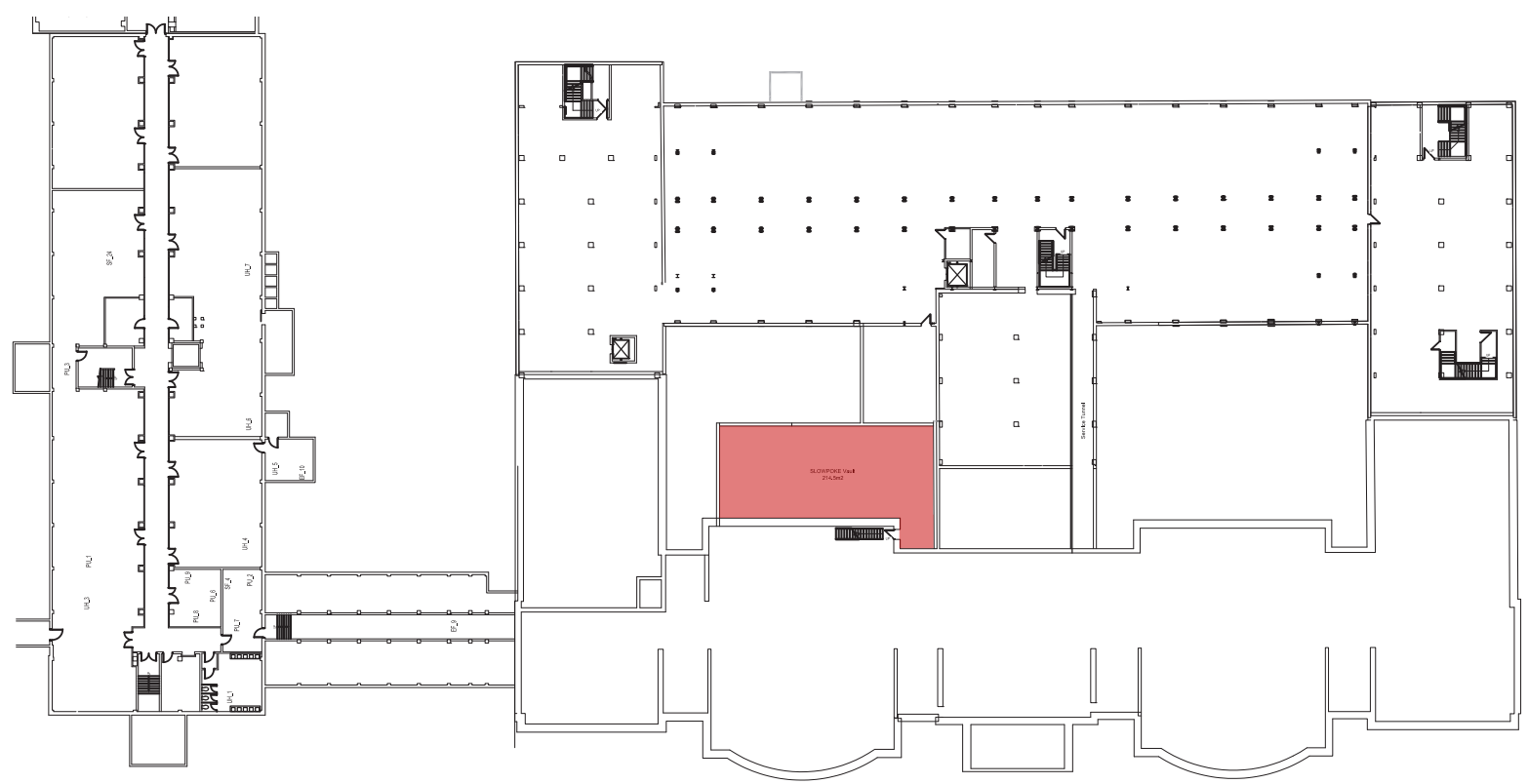
- A power distribution system consisting of separate panel boards feeding the main floor lab area and basement Reactor Room.
- Existing stand-alone security system complete with motion detectors, keypad access and sounders.
- Fire alarm system as an extension of the base building system.
- Radiation detection alarms within the main floor lab space monitored through the RCMS system.



SLOWPOKE Existing Program

Level 1

- Offices in SAB Link (approx. **41.6m²**)
- Labs in Dentistry Pharmacy (approx. **137.8m²**)
- Storage in Dentistry Pharmacy (approx. **37.8m²**)



Basement

- SLOWPOKE Reactor Vault (approx. **214.5m²**)

SLOWPOKE Program Areas (Approximate)

	Existing		
Reactor Vault	214.5 m²		
Labs	137.8 m²		
Offices	41.6 m²	79.4 m² (Total)	
Storage	37.8 m²		

4. SLOWPOKE Facility Construction Phase Operation

Architectural

In the transition between the current facility's operation and the permanent condition in the fully redeveloped Dentistry Pharmacy Building the SLOWPOKE Facility will undergo several stages of development:

1. Isolation and Protection of SLOWPOKE
2. Interim Operation
3. Integration with the redeveloped Dentistry Pharmacy Building.

Isolation and Protection

The purpose of this sequence is to make the SLOWPOKE Facility standalone and to protect its operation from the construction activity for the duration of the DPBR.

Interim Operation

As part of the Dentistry Pharmacy Redevelopment project the existing link between the South Academic Building and Dentistry Pharmacy is intended to be demolished and replaced with a new link and program space. The phasing of the construction of this link is still under review and the timing of its development will have differing effects on the SLOWPOKE Facility transition if it is scheduled before and/or concurrently with the DPBR or after the DPBR is completed.

Two potential Scenarios exist for the SAB link work:

Scenario 1: SAB Link Redevelopment occurs after DPBR

In this Scenario the existing Offices in the SAB link can remain in place until the new Offices are ready for occupancy within the renovated Dent Pharm building. There are existing washroom facilities and access to exits at the East end of the link that could be used in the construction phase for the Facility. A single additional exit would be required connecting the circulation corridor with the exterior to the South of DPB. Finally the existing exit at the East end of the SAB link could also act as the delivery route for isotopes to the SAB Courtyard for pickup.

Scenario 2: SAB Link Redevelopment occurs before or concurrent to DPBR

With the SAB link demolished earlier in the schedule temporary offices would need to be created within DPB and proximate to the existing Labs. Temporary washroom facilities would need to replace those lost in the SAB link. Two new exits need to be created to service the circulation corridor outside of the existing Labs. As the SAB link will no longer be accessible a much longer route to the North service road would need to be created within DPB to accommodate isotope delivery.

Proposed Construction Sequences of the two Scenarios is as follows:

Construction Sequence Scenario 1:

1. Protection of SLOWPOKE
2. Temporary Mechanical and Electrical Systems
3. Construction of SLOWPOKE Demising Walls
4. Construction of new exits

Construction Phase

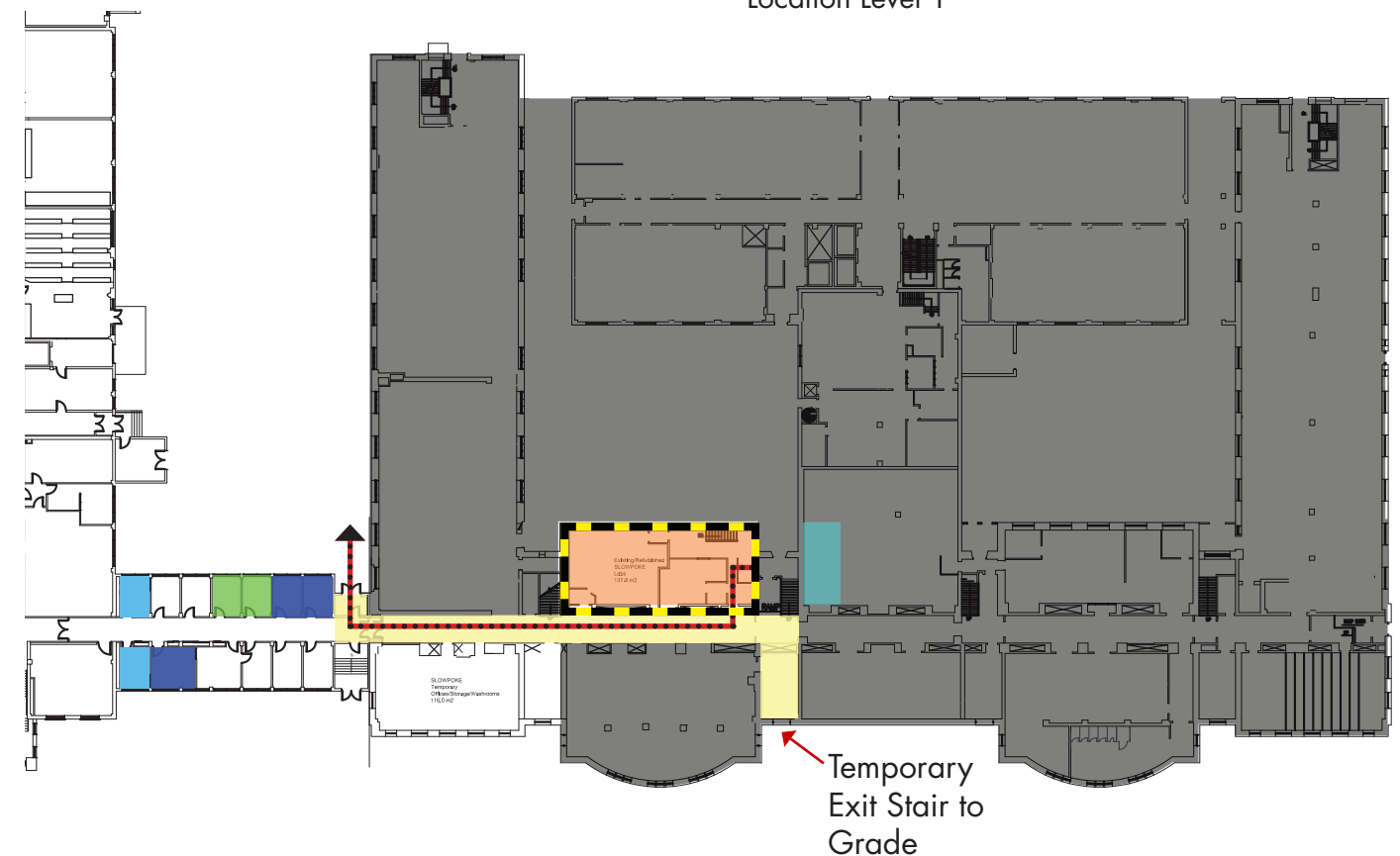
5. Construction of Atrium Structure
6. Construction of New Lab Corridor
7. Installation of Permanent Mechanical and Electrical Systems
8. Construction of New Labs - Basement
9. Move Existing Labs to new Lab location
10. Renovation of Level 1 Lab Space for New Offices
11. Move Existing Offices from SAB Link to
12. New Office Location Level 1
13. Demolish SAB Link

Construction Sequence Scenario 2:

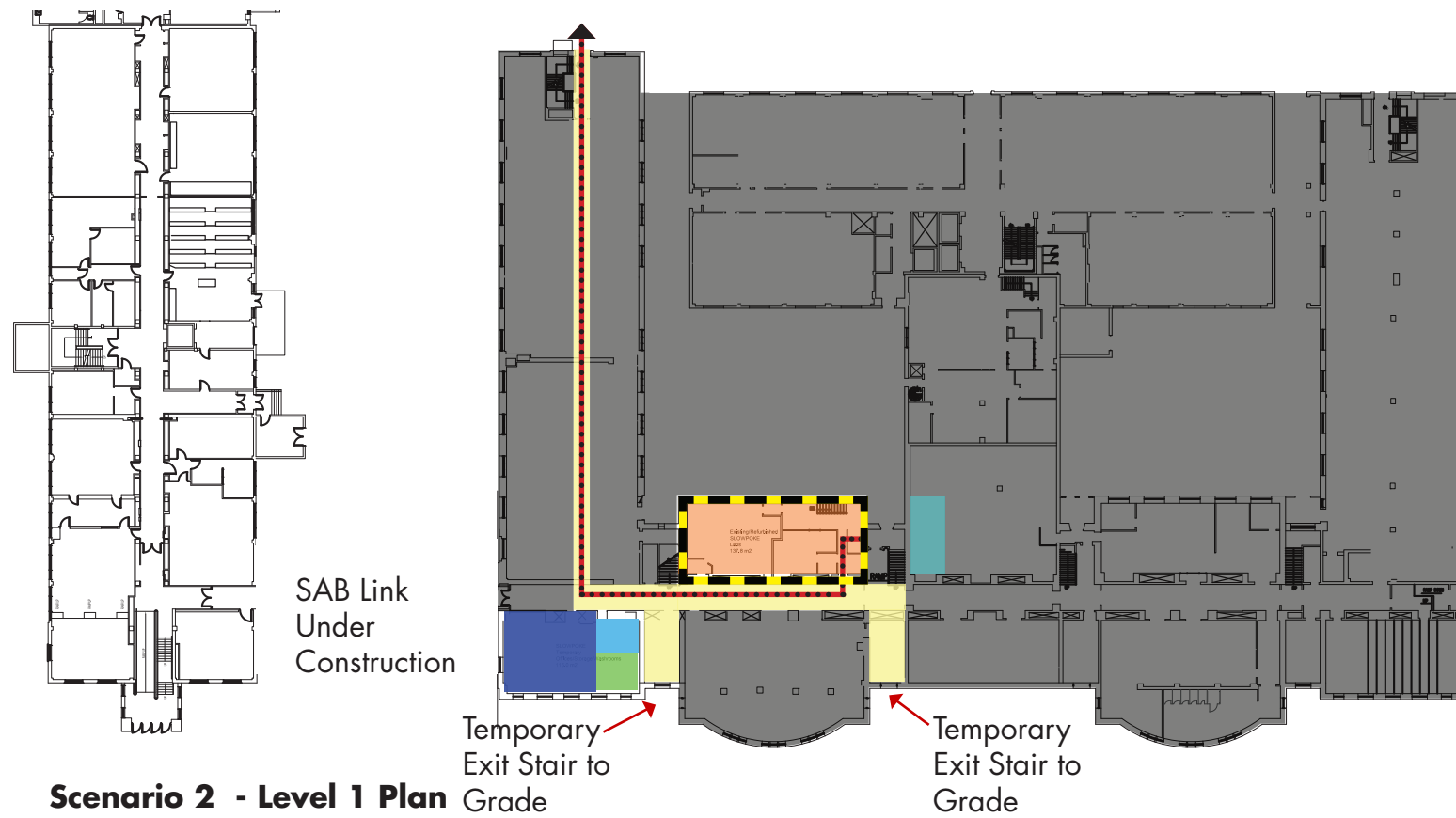
1. Protection of SLOWPOKE
2. Temporary Mechanical and Electrical Systems
3. Selective Demolition of DPB to create new Office space, washrooms and Storage for SLOWPOKE.
4. Construction of SLOWPOKE Demising Walls
5. Construction of New Offices in DPB
6. Isolation of delivery corridor.
7. Construction of new exits

Construction Phase

8. SAB Link Redevelopment
9. Construction of Atrium Structure
10. Construction of New Lab Corridor
11. Installation of Permanent Mechanical and Electrical Systems
12. Construction of New Labs - Basement
13. Move Existing Labs to new Lab location
14. Renovation of Level 1 Lab Space for New Offices
15. Move Existing Offices from SAB Link to New Office Location Level 1

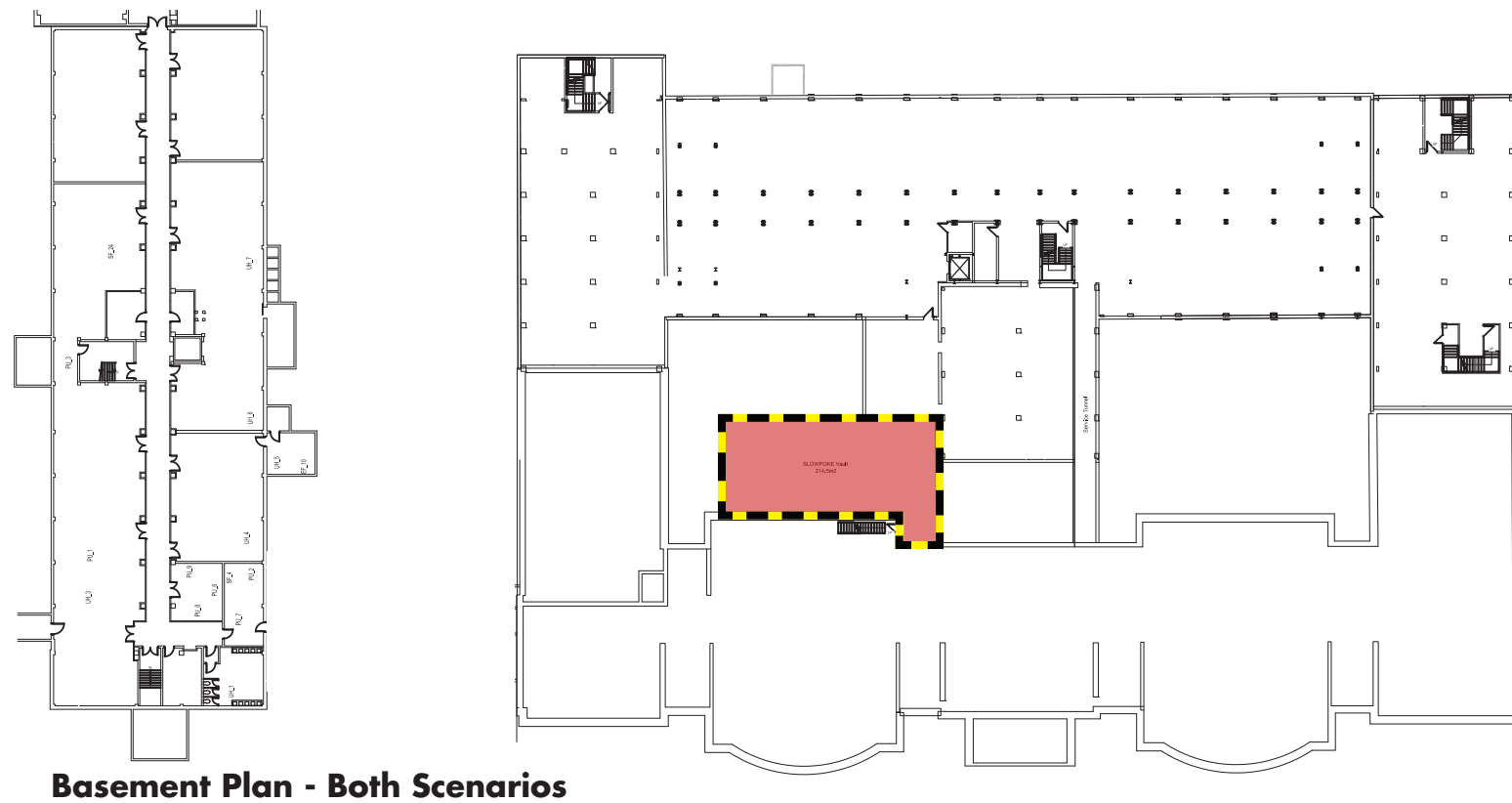


Scenario 1 - Level 1 Plan



SLOWPOKE Construction Phase: Scenario 1 Level 1

- Temporary Offices in Dentistry Pharmacy
- SLOWPOKE Labs remain in Dentistry Pharmacy
- Temporary SLOWPOKE Storage moved from Rm 1-012
- Temporary SLOWPOKE Egress Corridors
- Temporary Isotope Delivery Route
- Secure Zone
- Existing Washrooms
- Dedicated SLOWPOKE Mechanical Room
- Construction Zone



Basement

- SLOWPOKE Reactor Vault

SLOWPOKE Program Areas

	Existing	Decant	
Reactor Vault	214.5 m2	214.5 m2	
Labs	137.8 m2	137.8 m2	
Offices	41.6 m2	79.4 m2 (Total)	116 m2 *
Storage	37.8 m2		

* Includes space for temporary washrooms

Architectural (con't)

In either scenario the common requirements for Continued Operation are as follows:

1. Secure Separation

A three zone security perimeter is required between the outside public world and the Reactor Vault. In either scenario the three zones will secure:

- Zone 1: Building Exterior/Facility Perimeter/Construction Zone
- Zone 2: Lab (Future Office) Entry
- Zone 3: Reactor Vault

In Scenario 1 Zone 1 security will occur at the new South entry/exit point and at the Vestibule between the SAB Link and DPB.

In Scenario 2 Zone 1 security will occur at both of the new South entry/exit points.

In general all access points within Zone 2 and Zone 3 separations will incorporate key card and PIN pad features. In addition the demising partitions that separate the Facility and the Construction zone (Zone 1) will be constructed with an embeded mesh to prevent breach by Construction personnel.

At certain scheduled times during construction access to the SLOWPOKE Vault will be required to complete work within the Vault (new partition wall) and adjacent to the Vault for the construction of the new corridor that will eventually lead to the relocated labs in the basement. A separate workplan will need to be developed for this scope of work to ensure that the security of the facility is maintained.

At completion of redevelopment the Facility will need to become part of completed building, fully integrated.

2. Access/Circulation

Access to the Facility must be maintained during construction. Access will be from the corridor south of the SLOWPOKE labs on Level 1 that will connect the offices, labs, storage and washroom facilities - the existing lab/reactor vault will remain in place. The corridor will require exits at either end.

Scenario 1 Access Solution:

In the redeveloped DPB several new entrance/exit points will be created on the South side of the building connecting Level 1 with the exterior. In Scenario 1 the SAB link will be available to provide access to exit on the West end of the corridor, and it is proposed that one of the four new exit/entrances be created as part of the Phase 1 work to provide the East end exiting.

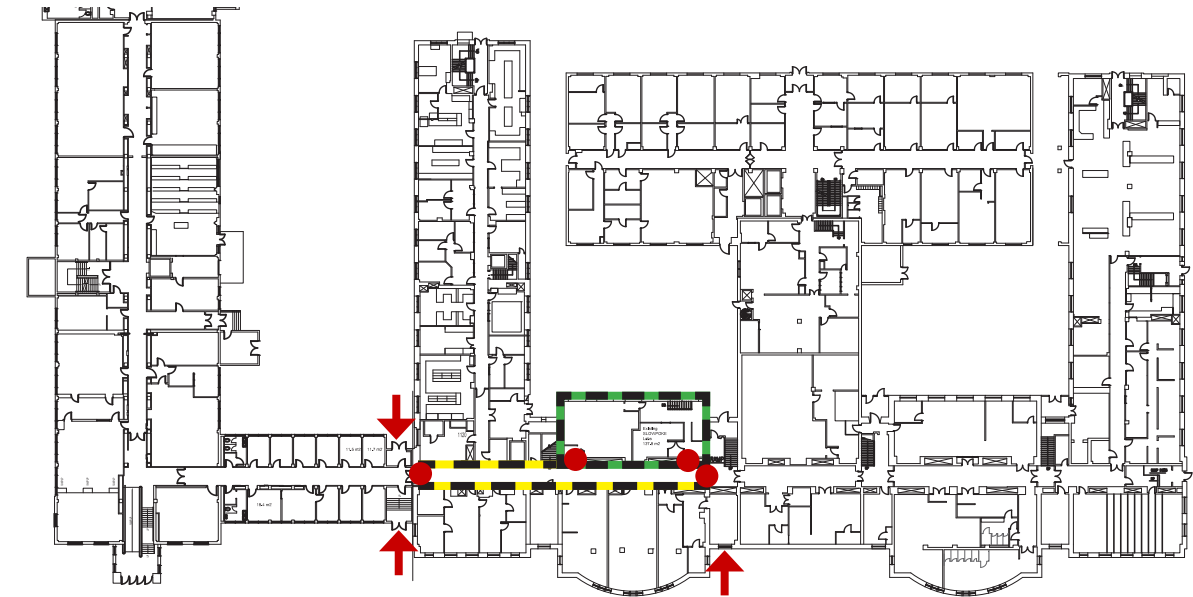
Scenario 2 Access Solution:

With SAB link connections unavailable two of the new exit/entrances would need to be created to provide exiting for the SLOWPOKE facility.

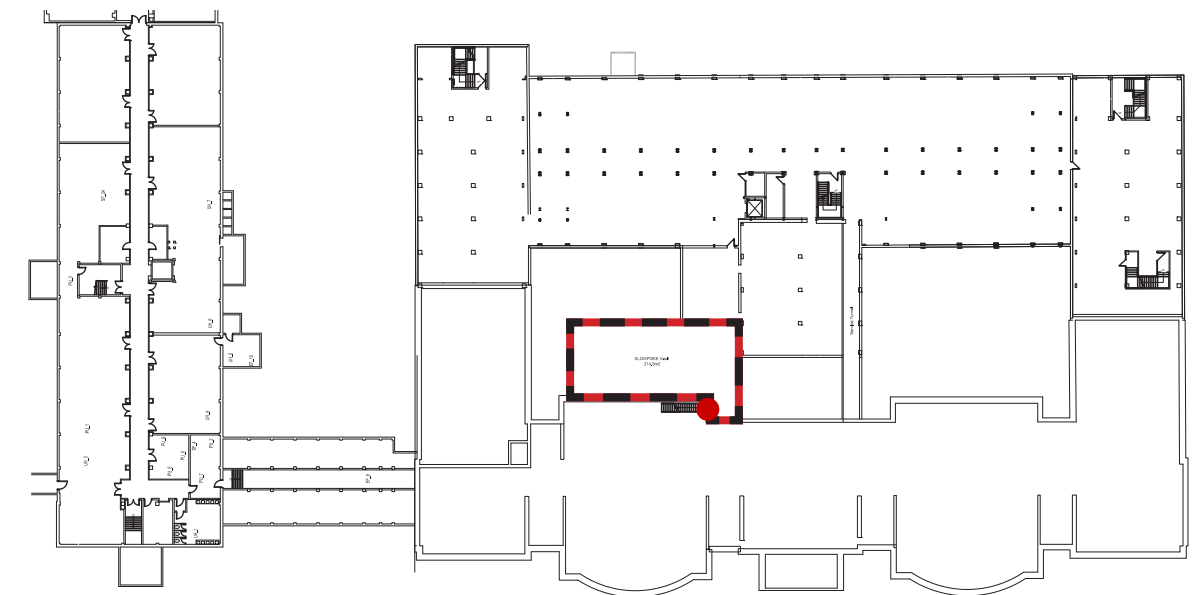
The corridor, its exits, and the Facility will require isolated services to allow construction to proceed around them.

3. Life Safety Systems

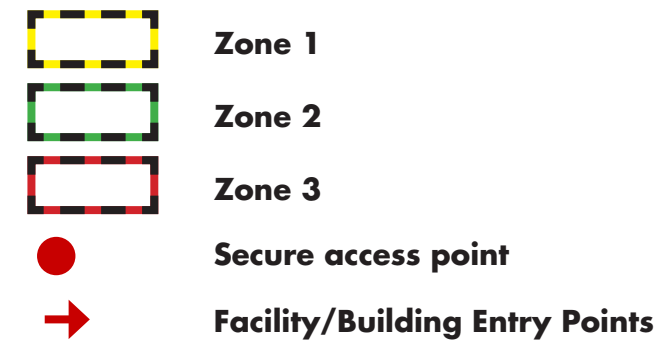
The isolated Facility will need to be provided with standalone Life Safety Systems for the duration of it's temporary operating condition including Fire Protection, Fire Alarm, Emergency Lighting, and Egress and Exiting from the Facility and the Building.



Security Zones - Level 1 Plan



Security Zones - Basement Plan



4. Isotope Transport

Delivery to and pick up from the Facility will need to be provided.

Scenario 1 Delivery Solution:

With the SAB link in place isotopes can travel from the Labs West down the corridor and exit at the North side of SAB link to a waiting delivery vehicle in the SAB/DPB Courtyard.

Scenario 2 Delivery Solution:

The existing North-South corridor in the West Wing will need to be isolated from the Construction Zone and delivery access to the North side of the building through the existing North-West exit stairwell created.

5. Monitoring

The existing SLOWPOKE Reactor 24/7/365 monitoring system will need to be maintained through the construction period with dedicated service.

6. Standalone Mechanical and Electrical Systems

See Mechanical and Electrical Construction Phase Operation below for the proposed isolated M&E systems that will support the SLOWPOKE Facility during the construction phase.

7. Support Spaces: Storage and Washrooms

Storage space and washroom facilities for SLOWPOKE staff are required during construction.

Scenario 1 Support Space Solution:

The Storage space currently within Rm 1-102 on Level 1 will be relocated to vacated office space within the SAB link adjacent the other SLOWPOKE offices. Existing washrooms within the SAB Link will be maintained.

Scenario 2 Support Space Solution:

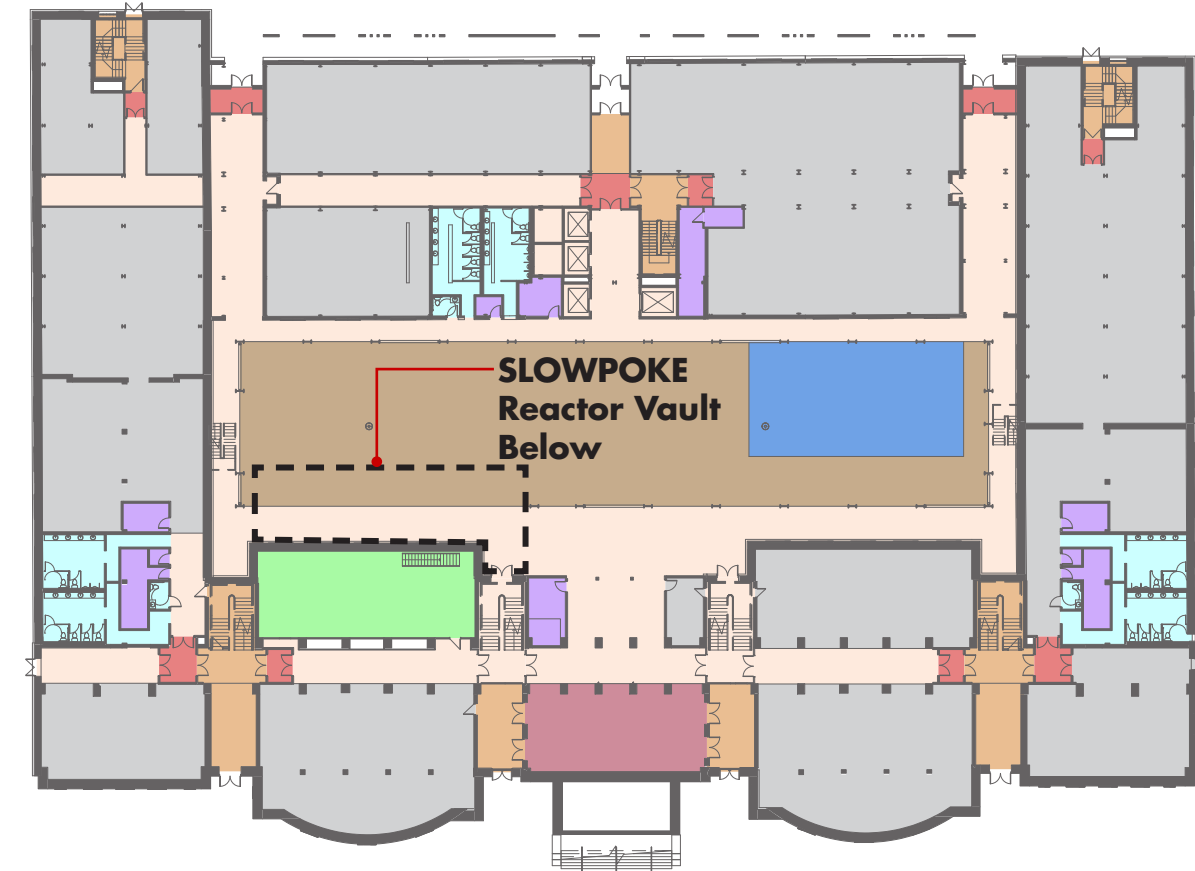
With the SAB link unavailable temporary locations will need to be provided for Offices, Storage and washroom facilities for the duration of the construction period of the DPBR. It is proposed that the existing Pharmacy lab space in the South-West corner of Level 1 be fit-up for this purpose.

Structural

During the construction phase of the DPBR several structural activities will take place adjacent the SLOWPOKE Facility.

Atrium Structure

The Atrium structure has been designed without bearing directly onto the SLOWPOKE reactor facility. Bored pile foundations beneath the main columns have been placed at a distance from the building to avoid any interaction with the existing foundations and can be installed without inducing any vibration into the existing building. The lower truss within the southern wall of the Atrium will be designed to support a 7000lb point load centred on the 4ft precast opening above the reactor vessel. This will provide a hoist point for a block and tackle lifting system. The connecting plates will be detailed however only installed at the time decommissioning to eliminate the need for yearly inspections. The elevation of the lower boom of the truss will be at least 5500mm above the current SLOWPOKE roof slab with the final elevation determined upon confirmation of lifting tackle dimensions.



Level 1 Partial Plan - Atrium

Centre Wing demolition

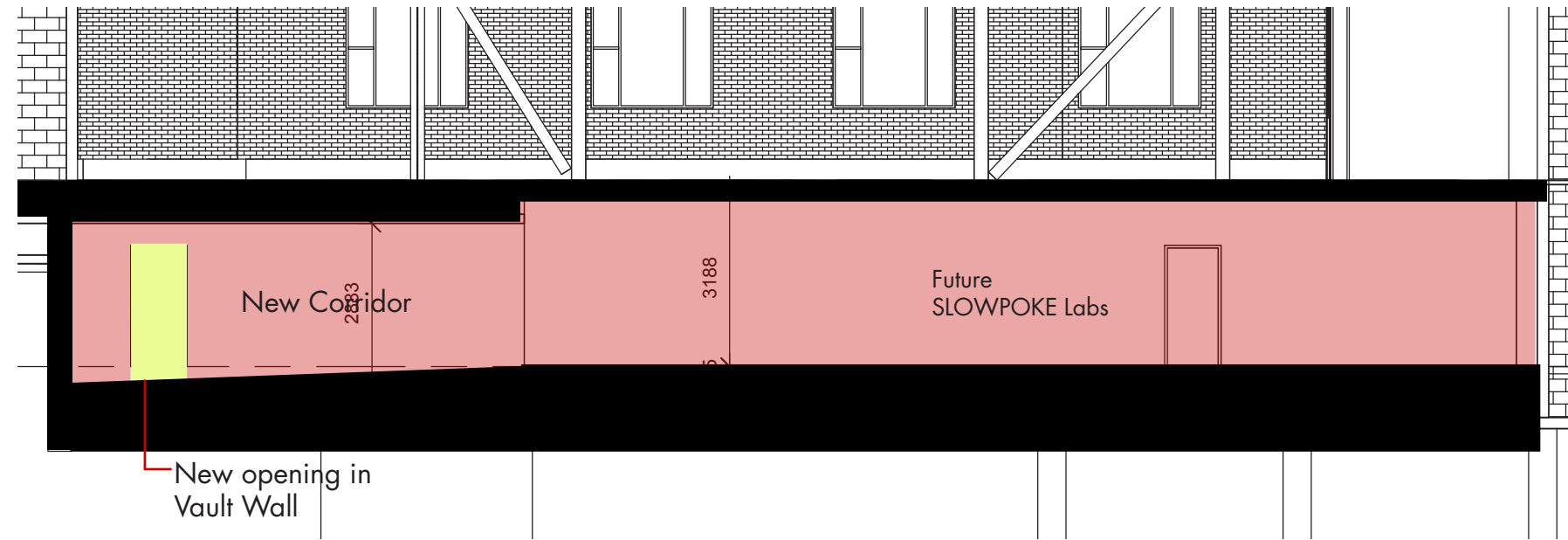
The centre wing consists of a steel frame from main to first that supports a loadbearing masonry structure with a central row of steel columns from levels 1 to 4. The floors are typically 75mm concrete slabs supported on OWSJ's that span between the external masonry wall and the central steel frame. The upper floors and walls will be removed in small segments using low vibration power tools to reduce vibration and noise. Method statements will be developed with the demolition contractor to ensure the process is undertaken in small segments, the walls are taken down towards the centre of the building, waste material chutes are installed and all debris is transported out of the east atrium exit. We will also stipulate that a protective hoarding is provided over the footprint of the Slowpoke. The existing slab at Main floor remains in place.



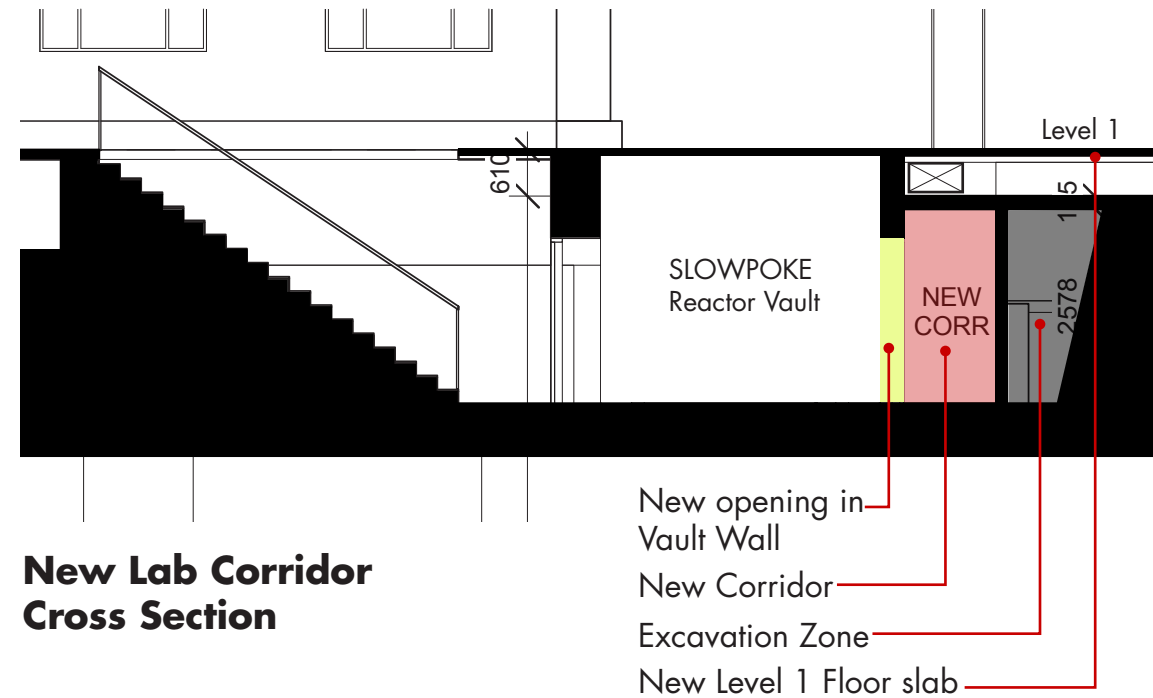
Centre Wing from West Courtyard

Lab Corridor

To form access to the laboratories a 2500mm high by 1000mm wide aperture needs to be formed in the existing 1200mm thick SLOWPOKE flank wall running N-S. To achieve this we intend to use hydro demolition techniques that utilize the power of high pressure jetting for the controlled removal of concrete with no damage or vibration to adjacent areas. The method typically uses 10,000gallons of water in a day and to prevent any water damage vacuum trucks will be used to control water and debris removal. Water will be collected continuously as the work progresses. Prior to the works commencing props will be installed to support the roof slab adjacent to the opening. Upon completing the removal works the head of the aperture will be strengthened with steel sections bolted into the concrete flank walls.



**New Lab Corridor
Longitudinal Section**



**New Lab Corridor
Cross Section**

Mechanical Construction Phase Operation (Phase 1)

SLOWPOKE REQUIRED UTILITIES (TEMPORARY)

New, completely dedicated temporary utilities will be provided for the SLOWPOKE reactor space, office space and lab space. All utilities will be connected to campus utilities in the utilities tunnel with independent shut-off valves, allowing for SLOWPOKE operations to be independent of other building services. Services provided for SLOWPOKE operation are:

- New Temporary Compressed Air (generated from the central plant)
- New Temporary Natural Gas (generated from the central plant, used for fume hoods in lab spaces only)
- New Electrical service with 100% emergency generator backup (for space heating and cooling)
- New Temporary Ventilation Air
- Existing Exhaust Air
- Existing Controls for monitoring the SLOWPOKE (connected to the RCMS)
- New Temporary Domestic Cold & Hot Water
- New Temporary Distilled Water
- Existing Sump Pump operation
- Existing Sanitary System

TEMPORARY SLOWPOKE VENTILATION SYSTEM

Ventilation of the SLOWPOKE reactor room, office and lab space will be provided by a dedicated, stand-alone 100% outside air ventilation unit which will be located on grade outside the building. The unit will be protected from tampering with a secure chain-link fence surrounding the outdoor equipment. The unit sized at 2,360 L/s (5,000 cfm) (based on matching the existing ventilation needs) will incorporate the following components:

- MERV13 filtration (90% efficient).
- Gas fired in-direct fired heating
- SCR modulating electric heating coil
- "Fan Array" style (multiple fans) for supply fans with variable frequency drives.

The key redundancy feature is the "fan array" which will be sized to allow for N+1 redundancy.

New supply air ductwork will be distributed to the reactor room and lab space through the existing building tunnels.

SLOWPOKE EXHAUST SYSTEM

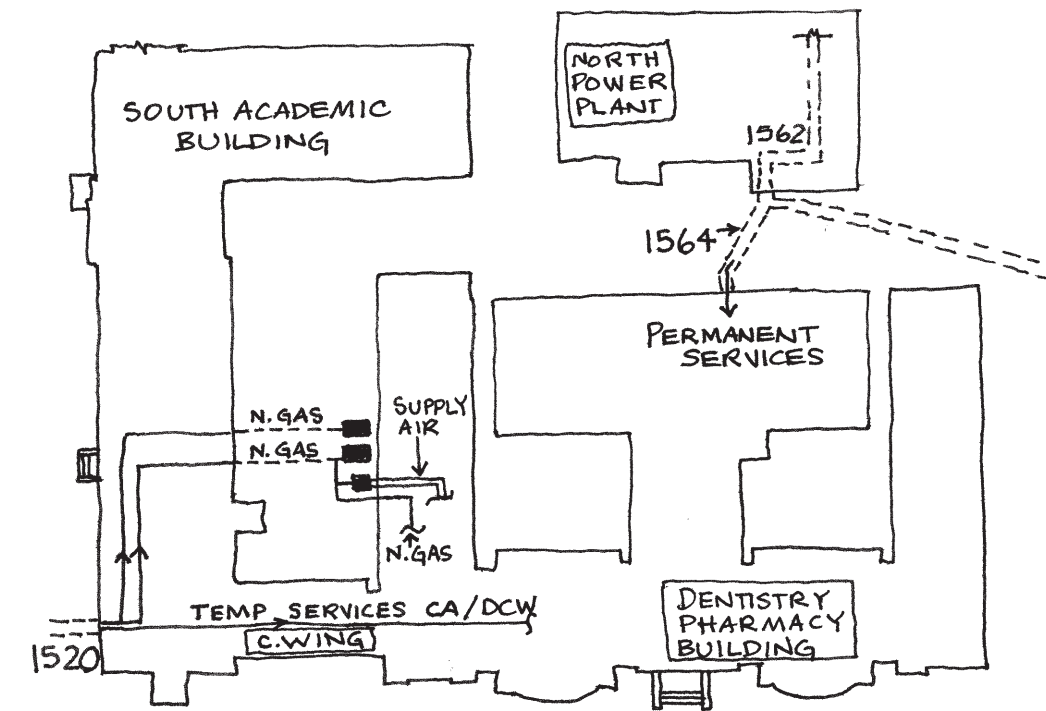
There are two existing exhaust systems serving the SLOWPOKE reactor spaces, a general reactor room exhaust and a nuclear exhaust for the reactor pool and fume hoods. Both exhaust systems currently have independent exhaust fans located on the roof. Both exhaust fans and associated existing ductwork will remain in operation as a part of phase 1 until the new exhaust systems are in place.

TEMPORARY SPACE HEATING SYSTEM

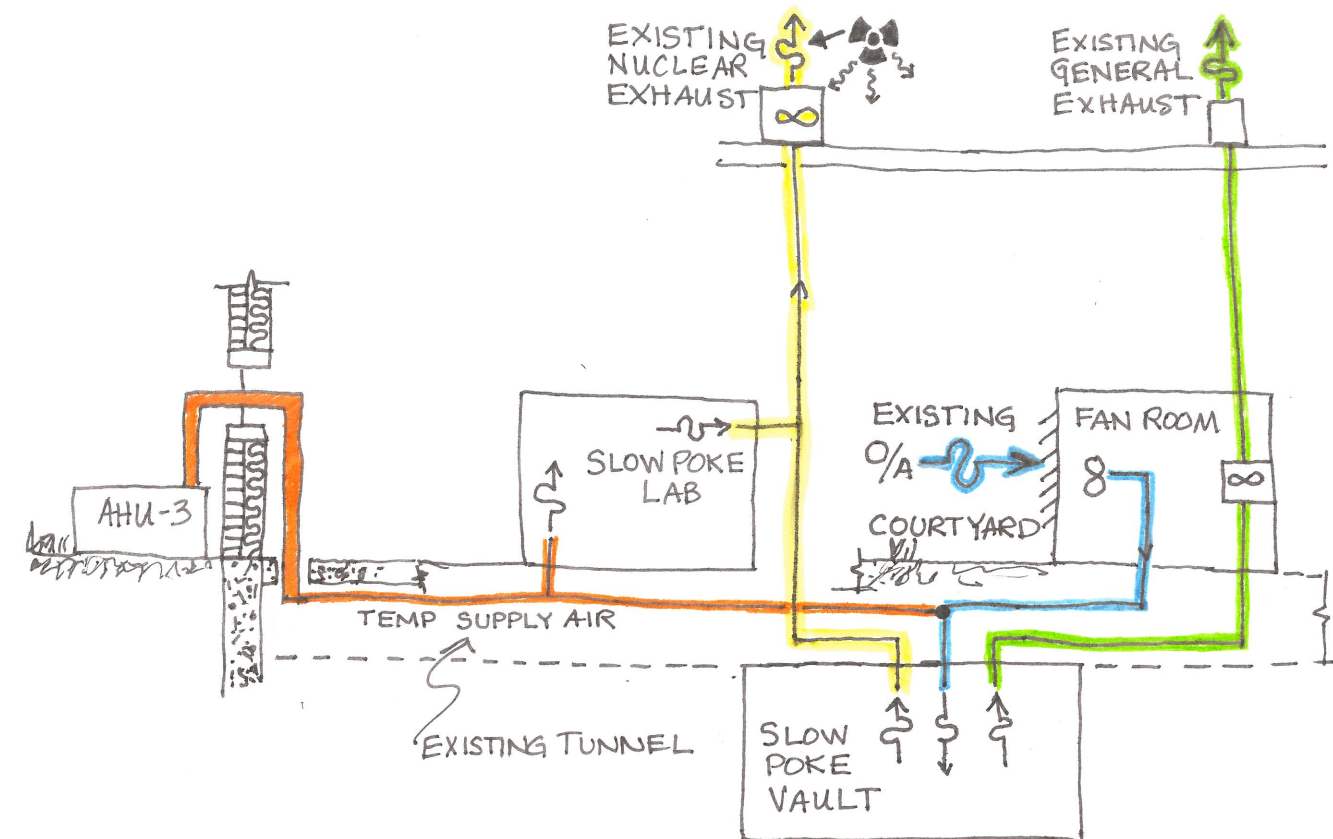
Space heating of the existing SLOWPOKE reactor space will be provided through the existing electric duct heater. Space heating of the existing SLOWPOKE lab and office spaces will be provided through temporary electric baseboard heating. All electric heating will have a 100% emergency generator backup.

TEMPORARY SPACE COOLING SYSTEM

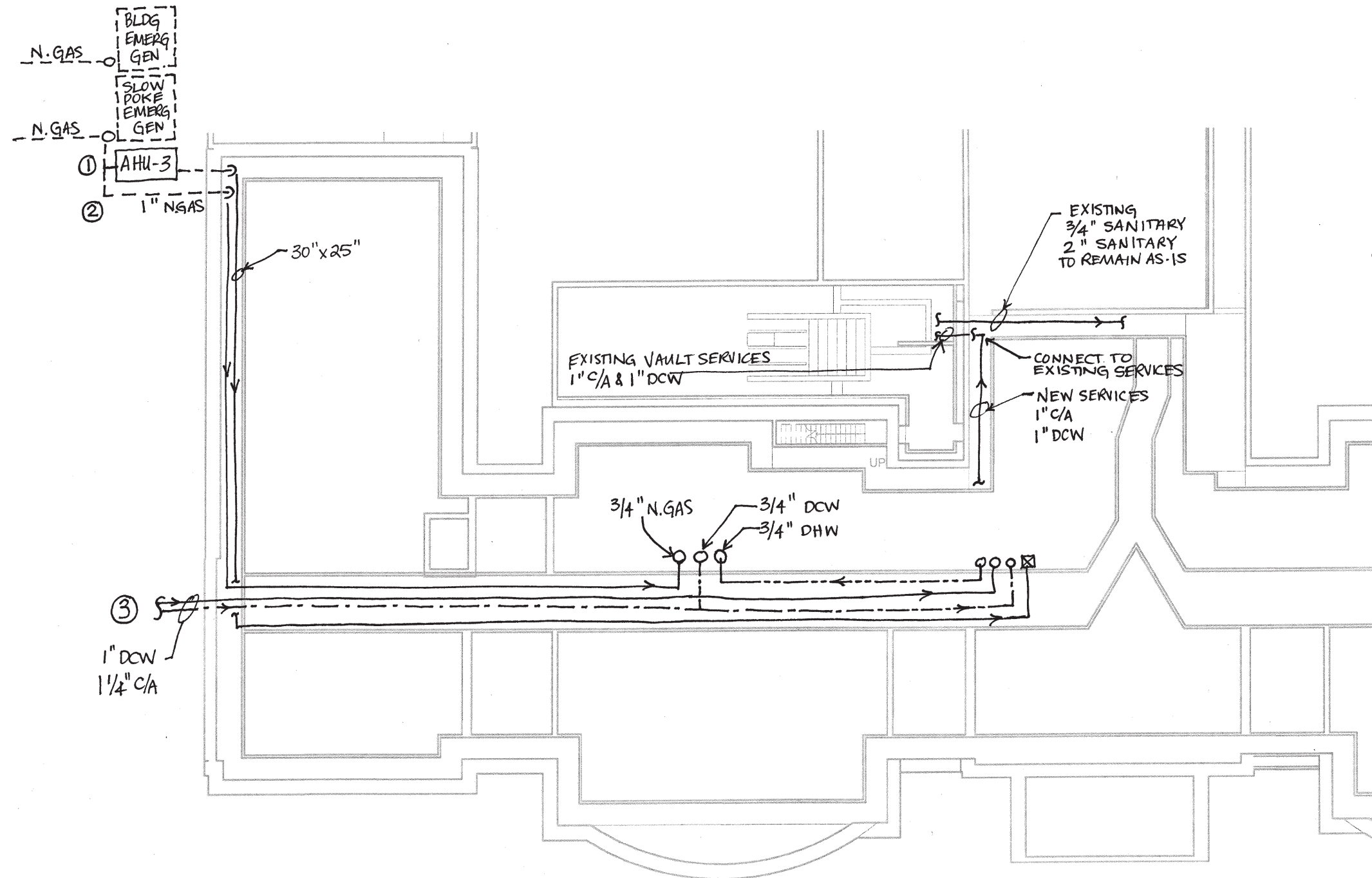
Space cooling of the SLOWPOKE lab and office space will be through the existing electric air conditioning units in the windows.



MSK-01: Temporary Utility Services



MSK-03: Temporary Air Delivery



MSK-02: Temporary Overall Tunnel Services

SLOWPOKE DOMESTIC WATER

A new temporary domestic cold water line will be provided from the campus utilities service tunnel complete with a dedicated SLOWPOKE reduced pressure backflow preventer assembly. Plumbing systems will be distributed to the reactor room and lab space through the existing building tunnels.

A new temporary electric domestic hot water tank will be located in the temporary SLOWPOKE mechanical room on the main floor of the Dentistry Pharmacy building to serve the SLOWPOKE lab space.

SLOWPOKE SUPPORT SERVICES

New utility supplied temporary natural gas and compressed air will be extended from the campus utilities service tunnel to service reactor and laboratory spaces associated with the SLOWPOKE.

Distilled water serving the SLOWPOKE laboratory space will be temporarily served by a bottled system.

An existing sanitary sump pit serves the reactor pool which connects to a general building sanitary line. This sanitary line will be kept operational throughout the building construction.

TEMPORARY WASHROOMS

Should temporary washrooms be required based on the removal of the SAB Link Building, the temporary DCW main serving the SLOWPOKE areas will also serve the temporary washroom. A dedicated electric hot water tank located in the building tunnels will provide hot water to the temporary washroom space.

SLOWPOKE FACILITY SERVICES DOWNTIME

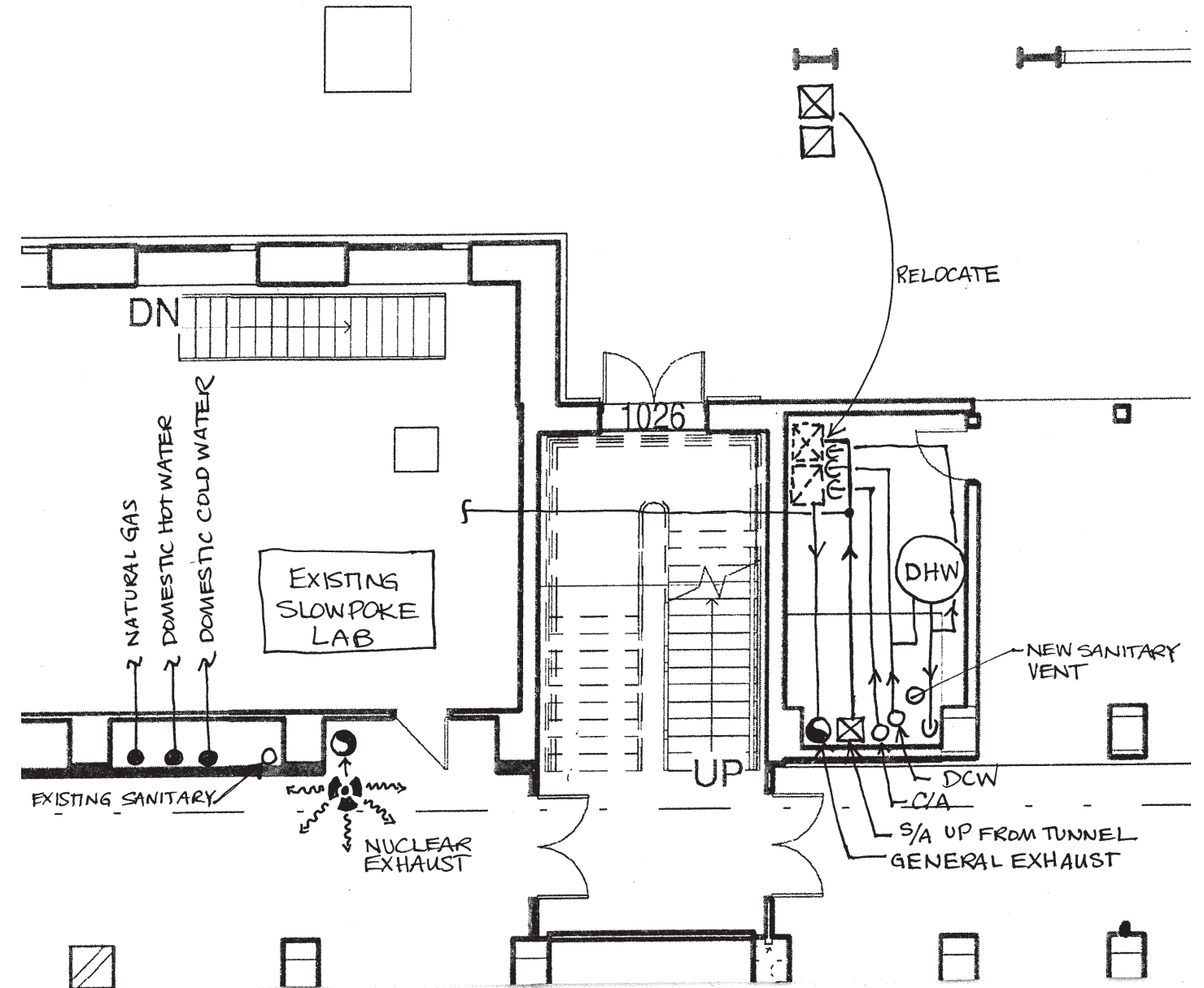
As some of the services will transition from the existing mechanical system to a new temporary system, short duration service downtimes can be expected. Services that will be affected by potential downtimes are:

- Compressed Air (two points of reconnection)
- Natural Gas (one point of reconnection)
- Space heating and cooling due to new electrical service (multiple points of connection)
- General exhaust and Nuclear exhaust systems due to new electrical service (two points of connection)
- Supply Ventilation Air (three points of reconnection)
- Domestic Cold Water (two points of reconnection)
- Domestic Hot Water (one point of reconnection)
- Distilled Water (one point of reconnection)

POTENTIAL UPGRADES TO EXISTING SYSTEMS

Some potential upgrades to the general mechanical design could be:

- An additional redundant sanitary sump pump located in the reactor room.
- An emergency natural gas shutoff switch within the lab space.



MSK-04: Temporary Services Existing Fan Room

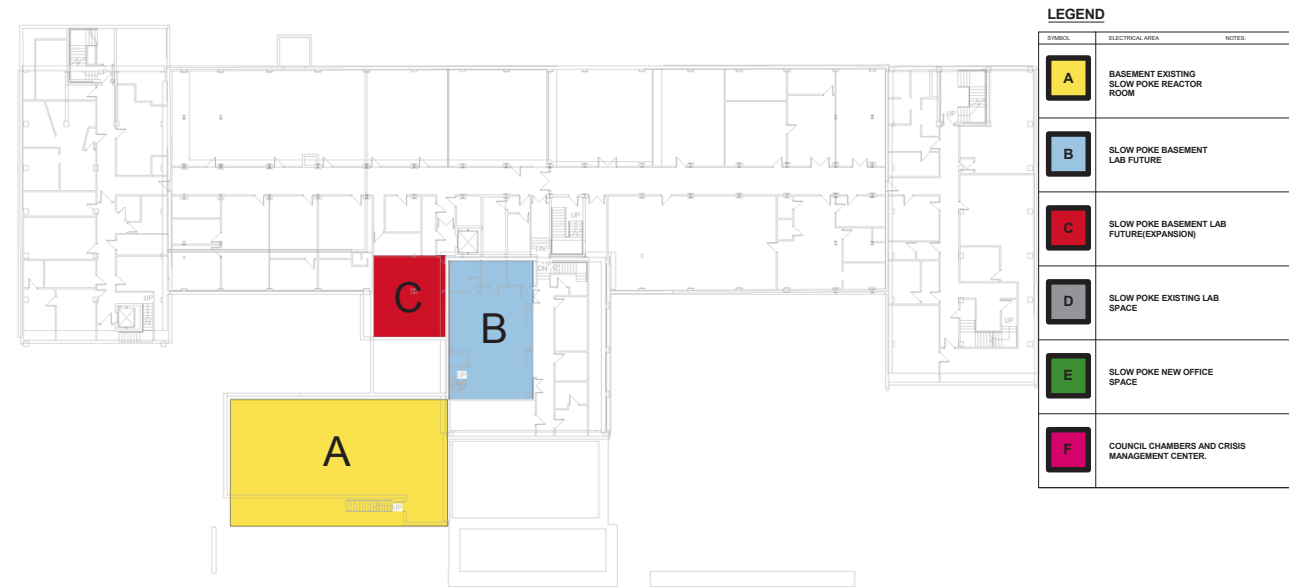
Electrical Construction Phase Operation (Phase 1)

SLOWPOKE REQUIRED UTILITIES (TEMPORARY)

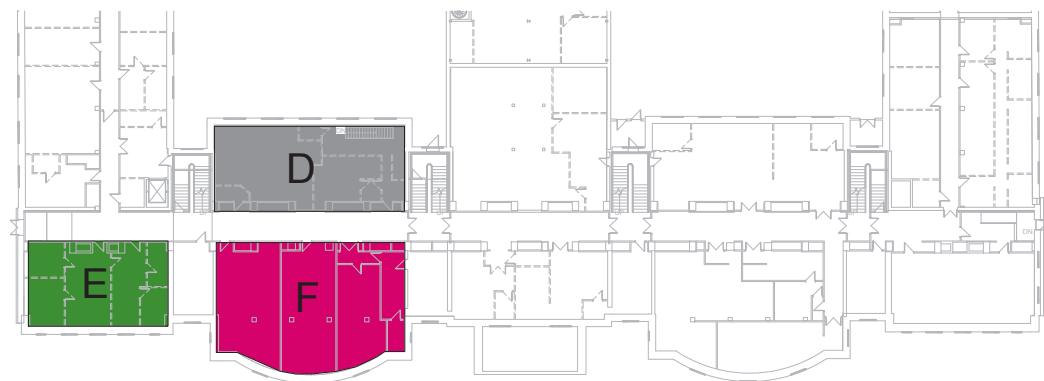
- A new dedicated power distribution system will be provided fed from the UofA Utility tunnel complete with a dual-primary service, ductbank provided from the existing manhole between SAB and Dentistry Pharmacy routed back to the central plant. A permanent new pad mount transformer complete with two switches will be provided on the west side of the building provided.
- A temporary electrical room will be provided in this location complete with an automatic transfer switch and Distribution panels.
 - o The new temporary power distribution system will provide power to the following areas:
 - Slow poke Reactor room, Lab and Office areas.
 - Council Chambers
 - Crisis Management Centre
 - Mechanical System
- U of A facilities will be providing the high voltage switching cubicle and transformer on site. All other distribution equipment including panels, generator, transfer switch, duct banks and low voltage dry type transformer shall be provided by electrical contractor. Refer to appendix for a details single line and site plan.

OFFICE SPACE AND LAB SPACE FIT-UP

- Existing lab shall be re-circuited to new dedicated lab panel.
- All new receptacles and devices shall be installed in a two compartment wire mould system above all existing lab benches.
- A new lighting system will be provided complete with emergency lighting consisting of battery packs and remote heads throughout the office and lab areas.
- All existing redundant devices shall be decommissioned and removed.
- Within the new office and council chambers space new recessed and suspended direct indirect T8/T5HO fluorescent lighting shall be provided and connected to dedicated room panels
- Within new office and council chambers new receptacles and device connections for AV equipment shall be provided and connected to dedicated room panels.
- A new dedicated emergency power distribution system will be provided complete with a 200kW, natural gas powered stand by generator complete with automatic transfer switch located to the west of the building housed in a weatherproof enclosure.
- A new security system will be provided complete with card access and key pad entry into the Reactor room and Lab areas.
- New fire alarm system will be provided during construction to ensure system interruptions are eliminated. New fire alarm control panel will be connected into the base building system in the future.
- Radiation detection alarms will be controlled through the UofA RCMS for monitoring purposes.
- A new dedicated communication service shall be provided to provide phone and data services to
 - o Slow poke Reactor room, Lab and Office areas.
 - o Council Chambers
 - o Crisis Management Centre



0-KEYPLAN BASMENT SLOW POKE



1-KEYPLAN LEVEL 1 SLOW POKE

SYMBOL	ELECTRICAL AREA	NOTES
A	BASEMENT EXISTING SLOW POKE REACTOR ROOM	
B	SLOW POKE BASEMENT LAB FUTURE	
C	SLOW POKE BASEMENT LAB FUTURE (EXPANSION)	
D	SLOW POKE EXISTING LAB SPACE	
E	SLOW POKE NEW OFFICE SPACE	
F	COUNCIL CHAMBERS AND CRISIS MANAGEMENT CENTER	

Post Redevelopment Operations

Architectural

Program

In the permanent reconfigured SLOWPOKE Facility within the redeveloped Dentistry Pharmacy Building new SLOWPOKE labs will be located in the basement adjacent the Reactor Vault which stays in its current location. The original lab space on Level 1 will be renovated to provide new office space for the SLOWPOKE Facility. At this point the Facility will be able to operate in its fully integrated condition with the rest of the Dentistry Pharmacy building.

Security Zones

The permanent security zones will offer the same three zone perimeter to the Reactor Vault. Zone 1 will move out to the Dentistry Pharmacy building perimeter, Zone 2 will exist at the entrance to the new Offices on Level 1 and at the Lab entrance in the Basement, and Zone 3 will be achieved by a new concrete block partition separating the new Lab corridor connection and the Vault.

Access/Circulation

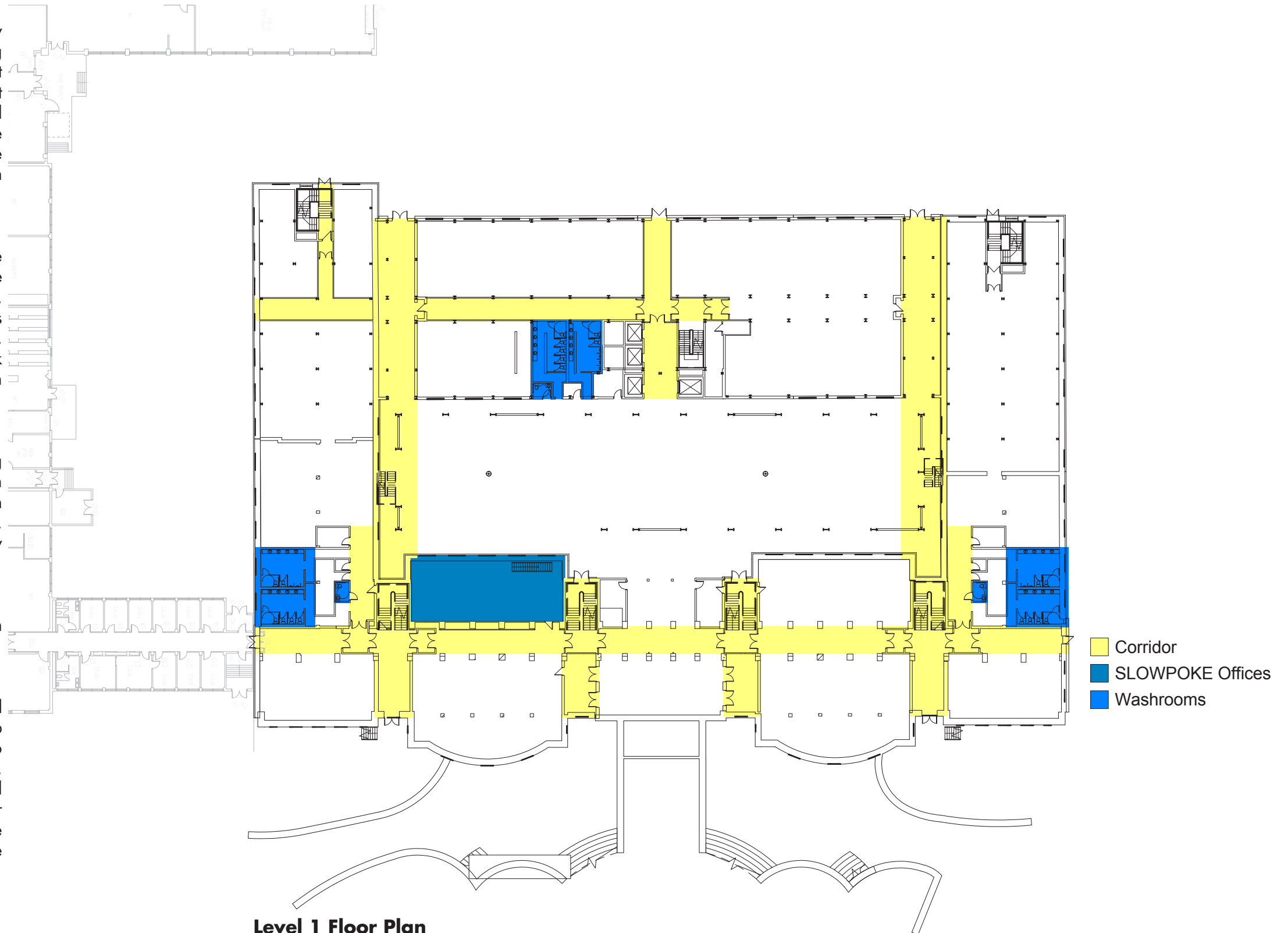
Within the redeveloped Dentistry Pharmacy building the SLOWPOKE Facility will be fully integrated with the new DPB's access and circulation system. In addition a new interior connection between Offices, Vault and Labs will allow users to access the Facility securely from within the Facility.

Life Safety

The SLOWPOKE facility will be fully integrated within the larger DPB life safety network.

Isotope Delivery

The new Dentistry Pharmacy Centre will be equipped with its own loading dock and with the new Lab location in the basement will require a new route to deliver the isotopes to transport outside the building. Directly adjacent the SLOWPOKE labs and connected with a doorway will be the building's service elevator which will be able to lift the shielded isotopes to the ground floor from where they can be taken down the hall to the loading dock to waiting trucks.

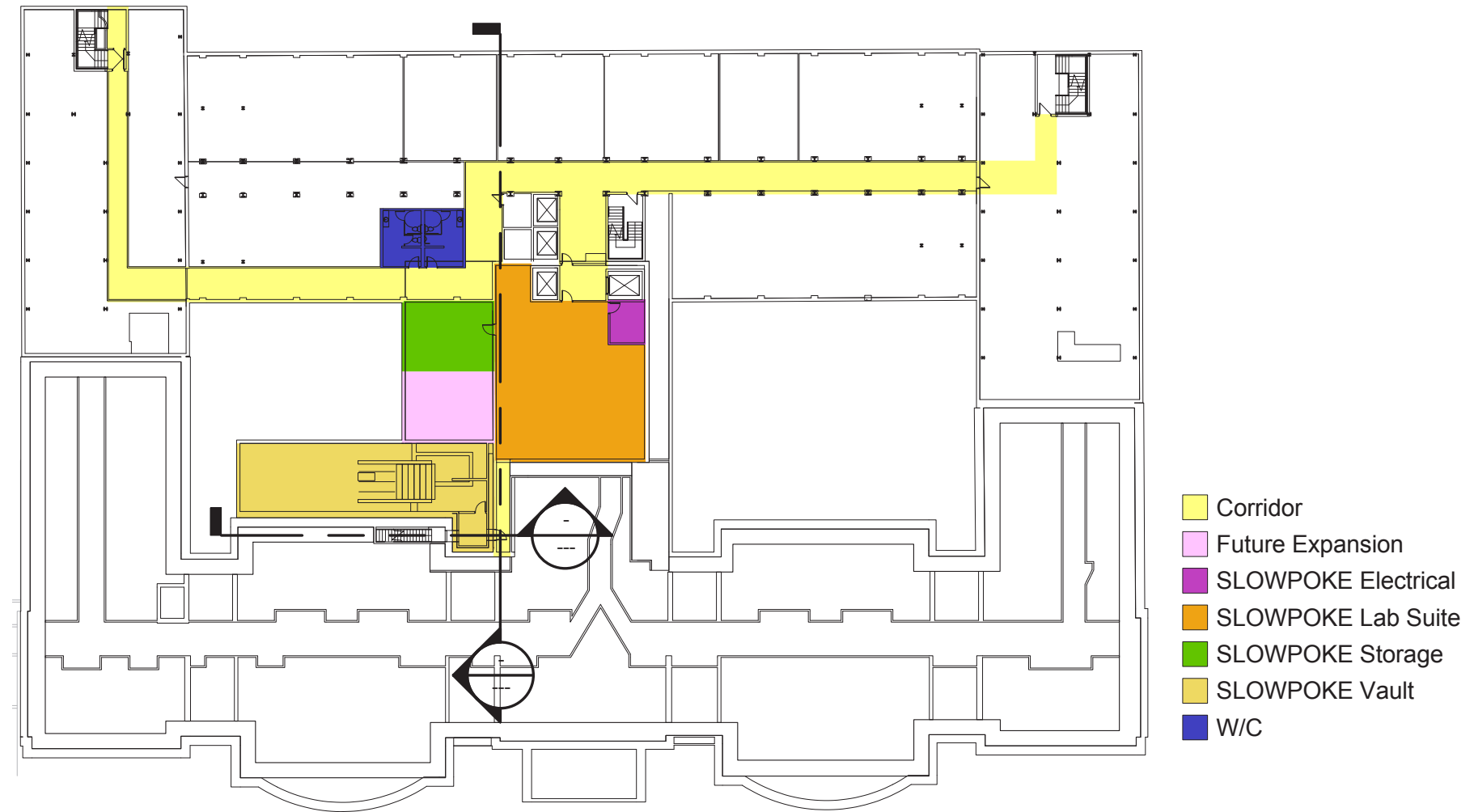


Monitoring

The 24/7/365 monitoring systems set up on standalone systems in Phase 1 will remain in operation permanently.

Standalone Mechanical and Electrical Services

Refer to the Post Development Operation for Mechanical and Electrical below for the intended permanent operation



Basement Floor Plan

Mechanical Systems - Post Redevelopment Operation

SLOWPOKE REQUIRED UTILITIES

New, completely dedicated utilities will be provided for the SLOWPOKE reactor space and lab space. All utilities will be connected to campus utilities in the utilities tunnel with independent shut-off valves, allowing for SLOWPOKE operations to be independent of other building services. Services required for SLOWPOKE operation are:

- New Dedicated Compressed Air (generated from the central plant)
- New Dedicated Natural Gas (generated from the central plant, used for fume hoods in lab spaces only)
- New Building Hot water Heating and 50% Glycol heating system
- New Building Chilled water system
- New Dedicated Ventilation Air
- New Dedicated Exhaust Air
- New Controls for monitoring the SLOWPOKE (connected to the RCMS)
- New Dedicated Domestic Cold Water
- New Building Domestic Hot Water
- New Dedicated Distilled Water
- Existing Sump Pump operation
- Existing Sanitary System

SLOWPOKE VENTILATION SYSTEM

Ventilation of the SLOWPOKE reactor room and lab space will be provided by a dedicated, stand-alone 100% outside air ventilation unit located in the new 7th floor penthouse mechanical room. The unit will be protected from tampering with a secure chain-link fence surrounding the ventilation unit equipment. The unit sized at 3,300 L/s (7,000 cfm) (based on matching the existing ventilation needs as well as allowing for future lab space) will incorporate the following components:

- Silenced supply plenum.
- MERV 13 filtration (90% efficient).
- Glycol heating coil.
- SCR modulating electric heating coil (backup heating)
- Water cooling coil.
- Steam grid humidification.
- "Fan Array" style (multiple fans) for supply fans with variable frequency drives.

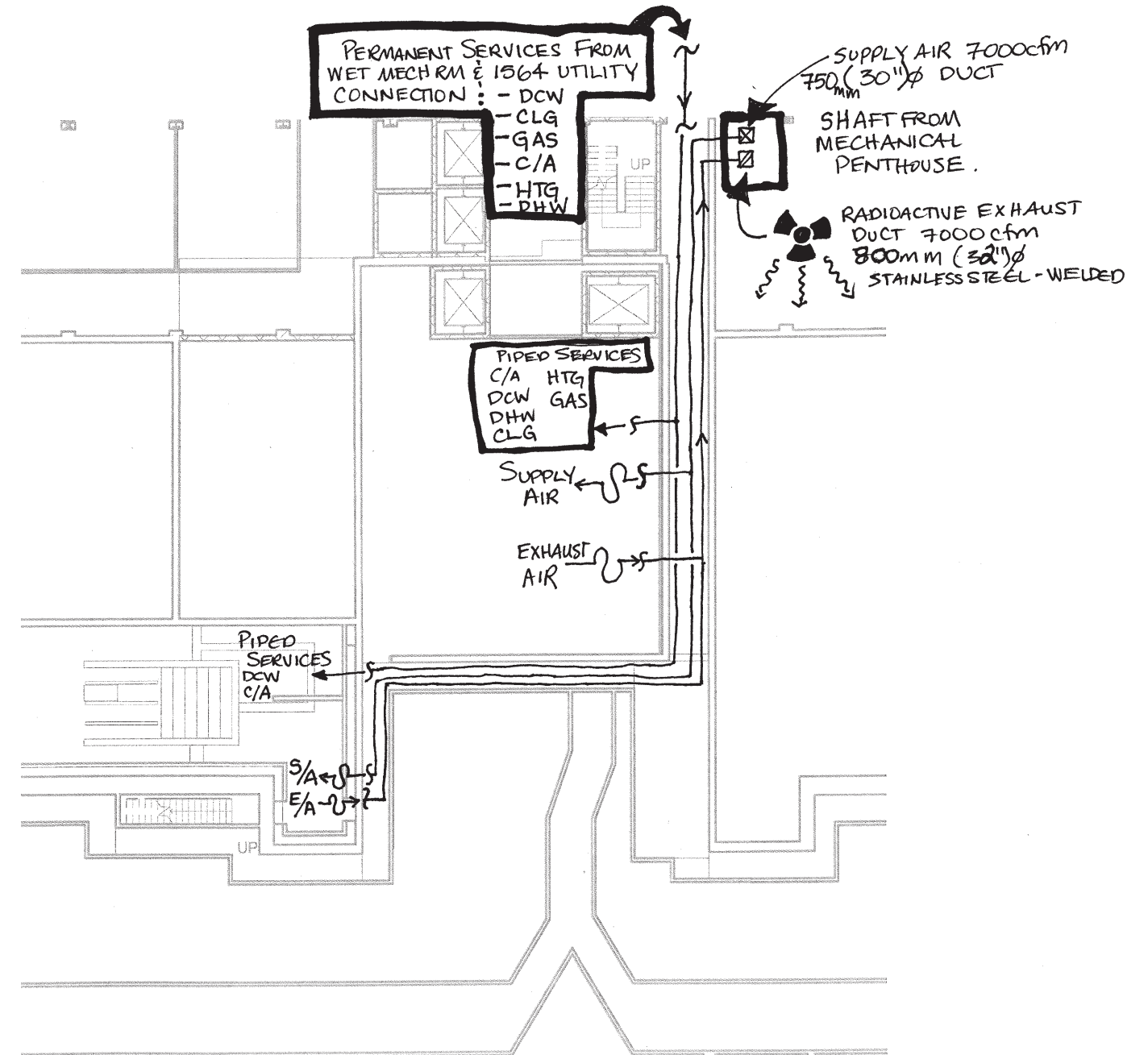
The key redundancy feature is the "fan array" which will be sized to allow for N+1 redundancy.

Supply air from the dedicated SLOWPOKE air handing unit will direct air to the SLOWPOKE spaces through the existing building shafts and tunnels.

For the SLOWPOKE office spaces, the general building ventilation system with a tempered air supply system with medium pressure distribution will be utilized, interfaced with a system of wet perimeter ceiling mounted radiant heating/cooling panels and ceiling mounted induction style "cold beams" to offset building envelope and internal heat gains.

SLOWPOKE EXHAUST SYSTEM

A new nuclear exhaust system with 100% redundant exhaust fans will support the existing SLOWPOKE reactor room and the new SLOWPOKE lab spaces. All horizontal exhaust duct lengths will be sloped in the direction of air flow to a condensate drainage sump pit.



MSK-05: Permanent Basement Mechanical Systems

SLOWPOKE HEATING SYSTEM

The permanent heating system will be provided through the building high pressure steam line from the campus utilities service tunnel. The steam will pass through a fully redundant 4 valve pressure reducing station.

Space heating of the SLOWPOKE reactor room and lab space will utilize hot water heating coils located in the dedicated supply air terminal box for each space. Duplex heater water circulation pumps (100% redundancy) will support the terminal box heating coils.

The dedicated SLOWPOKE air handling unit (AHU-3) heating coil will be connected to the building hot glycol heating system through a dedicated line. The building duplex (redundant) shell and tube steam to water heat exchangers and duplex heating pumps (100% redundancy) will produce and distribute the hot glycol for ventilation air heating. Each pump will utilize independent VFDs and full size impellers to optimize pumping efficiencies.

An electric heating coil (reused from the temporary system) will serve as a 100% heating backup should the primary steam/hydronic heating system fail.

SLOWPOKE COOLING SYSTEM

Space cooling of the SLOWPOKE reactor room and lab space will utilize the dedicated SLOWPOKE air handling unit (AHU-3) cooling coil connected to the building chilled water system through a dedicated supply chilled water line. The building duplex (redundant) shell and tube water to water heat exchangers and duplex heating pumps (100% redundancy) will produce and distribute the chilled water for ventilation air cooling. Each pump will utilize independent VFDs and full size impellers to optimize pumping efficiencies.

Cooling of the SLOWPOKE reactor room and lab space will be through the air system. Cooling will be provided through a dedicated chilled water line from the campus utilities service tunnel to serve a dedicated chilled water to chilled glycol heat exchanger. Dedicated duplex 100% duty/standby pumps will circulate chilled glycol to a cooling coil within the ventilation air handling unit. Each pump will utilize independent VFDs. Each pump will utilize full size impellers to optimize pumping efficiencies.

SLOWPOKE DOMESTIC WATER

Domestic cold water will be provided through dedicated domestic water lines from the campus utilities service tunnel complete with a dedicated SLOWPOKE duplex (redundant) reduced pressure backflow preventer assembly. Domestic hot water will be provided through a dedicated double wall steam to water heat exchanger located in the new north basement wet mechanical room. Plumbing systems will be distributed to the reactor room and lab space through the existing building service tunnels.

SLOWPOKE SPRINKLER SYSTEM

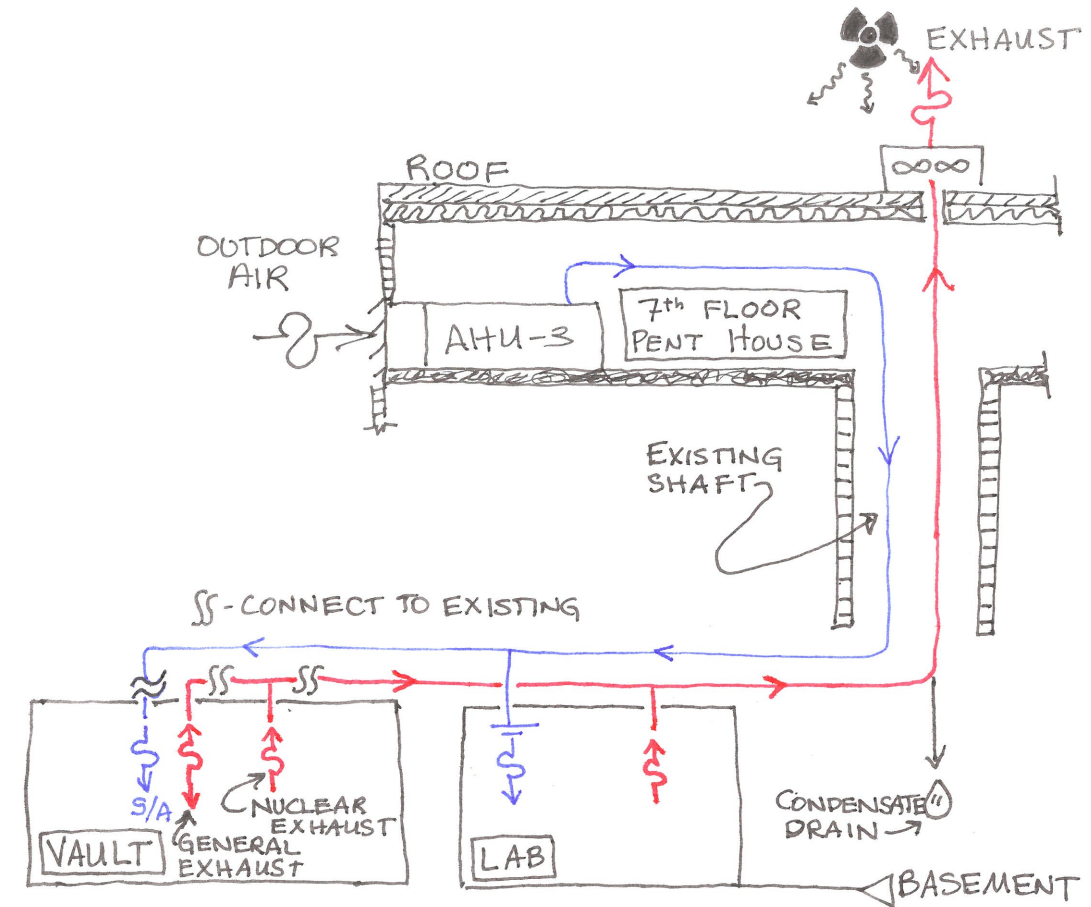
A new wet type sprinkler system as per NFPA 13 will be provide for both the reactor and lab spaces.

SLOWPOKE SUPPORT SERVICES

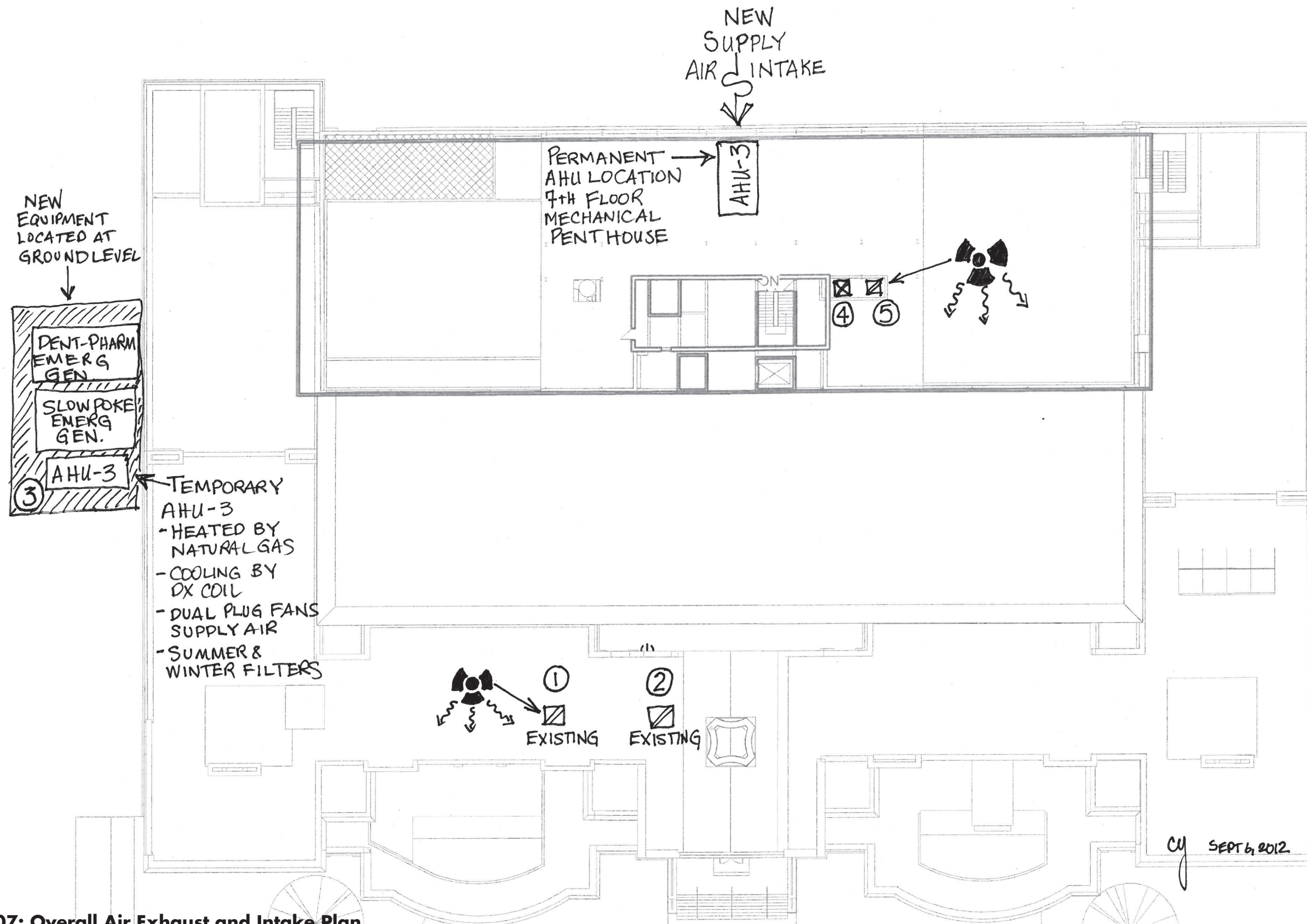
New campus utility supplied natural gas and compressed air will be extended from the new north basement wet mechanical room to service the SLOWPOKE reactor and laboratory spaces.

Distilled water serving the SLOWPOKE laboratory space will be served by a stand-alone dedicated distilled water system located within the lab space.

The existing sanitary sump pit serving the reactor pool will remain connected to the existing general building sanitary line.



MSK-06: Permanent Ventilation

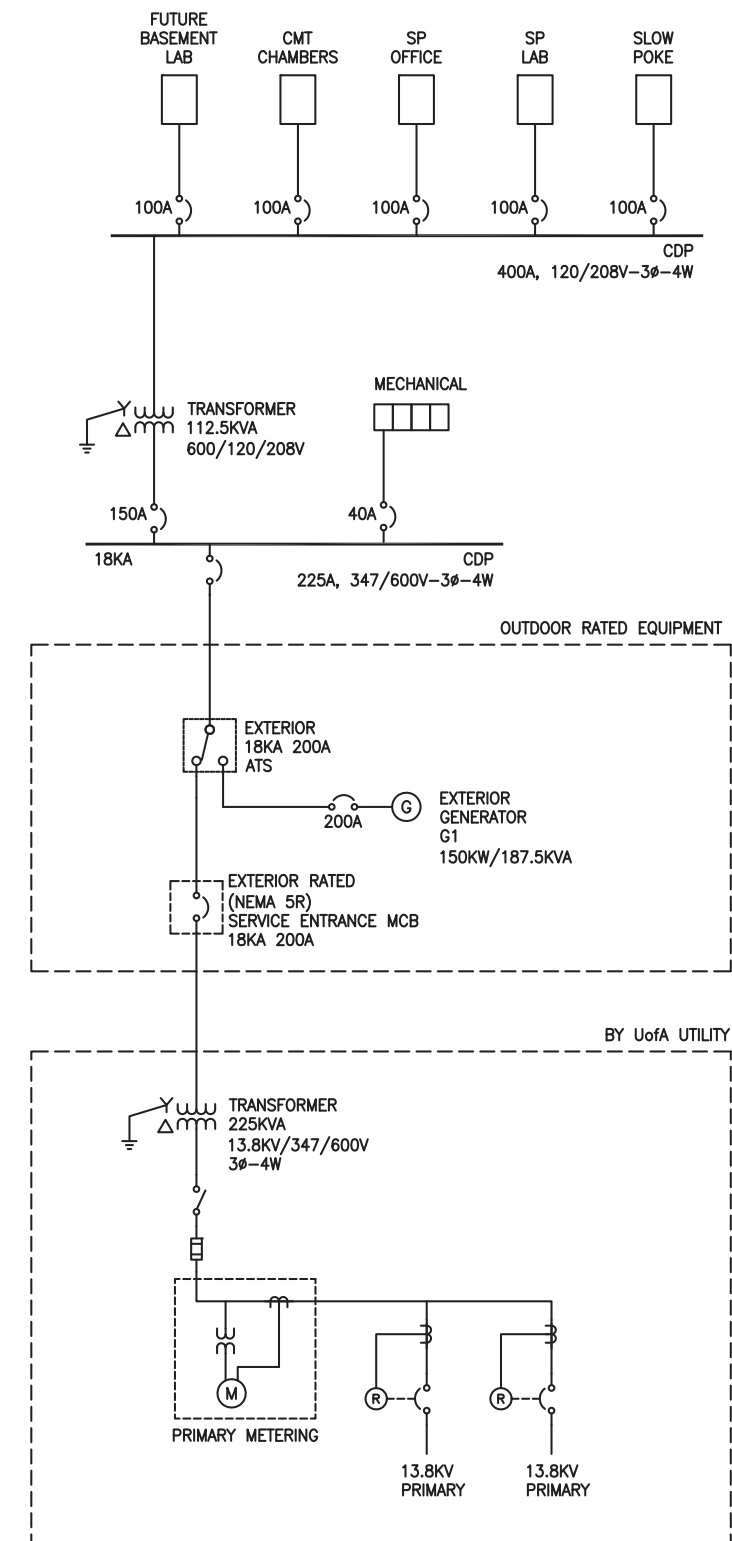


MSK-07: Overall Air Exhaust and Intake Plan

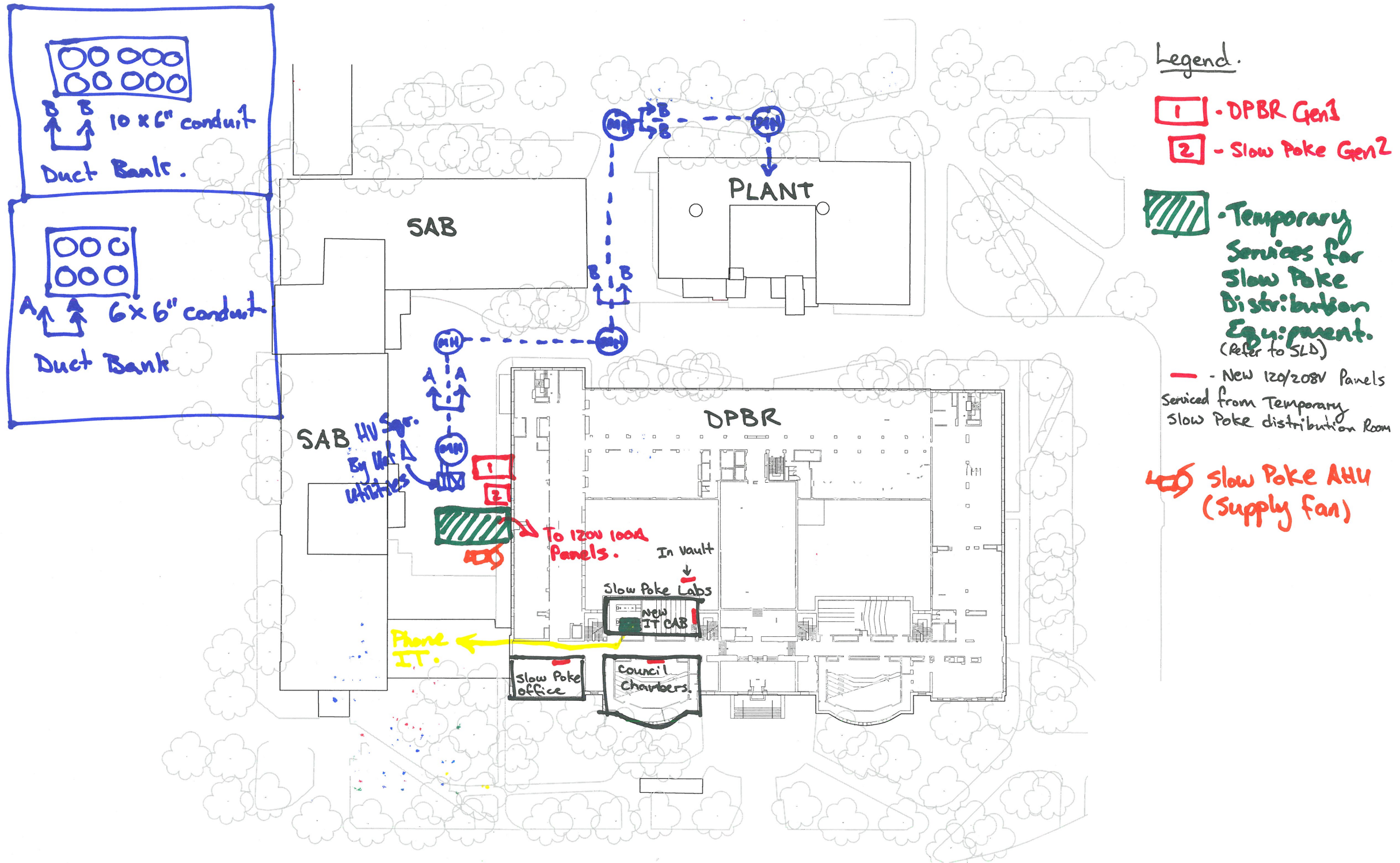
Electrical Systems - Post Redevelopment Operation

REQUIRED UTILITES (PERMANENT)

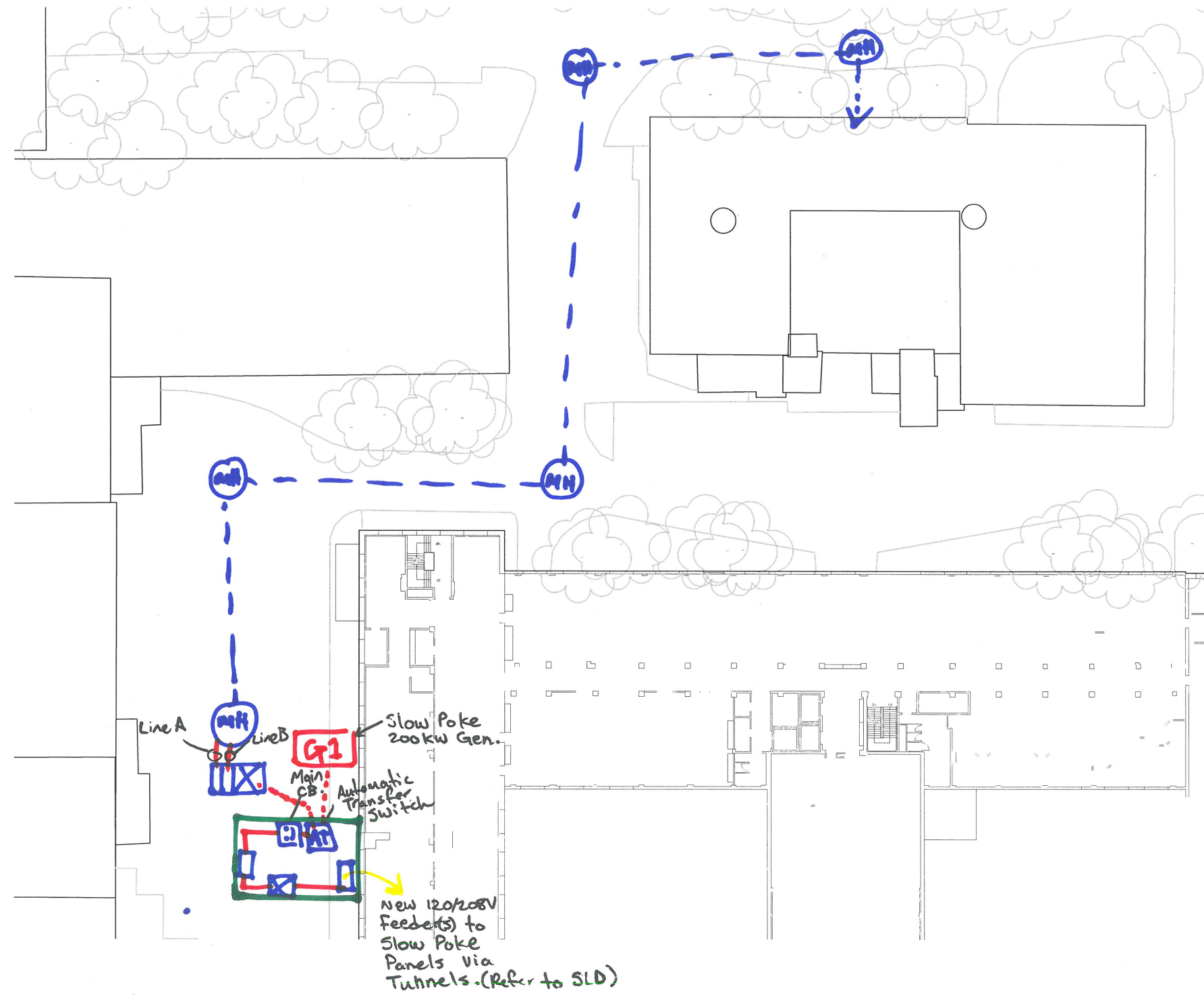
- For the permanent installation the slow poke generator and UofA utilities switching cubicle and utility transformer shall remain on west side of the site.
- All electrical distribution located in the temporary room on the west side of the site shall be duplicated and installed in the basement future lab as per attached sketches.
- A new service entrance feeder shall be provided to the west site dedicated slow poke utility and dedicated slow poke generator via existing tunnel below 1920's facility.
- From the permanent slow poke services new branch panel feeders shall connect to dedicated panels provided to the slow poke vault, new slow poke lab, and slow poke office.
- A new dedicated AHU shall be provided on the level 7 mechanical room. A dedicated service feeder is required to be supplied from the permanent slow poke electrical distribution (basement) to the level 7 AHU dedicated for the slow poke ventilation system.



ESK-01: SLOWPOKE Single Line Diagram



ESK-02: SLOWPOKE Duct Bank Service Plan



ESK-03: SLOWPOKE Services

Decommissioning/Re-fueling Plan

The Decommissioning plan for SLOWPOKE is comprised of three different stages:

1. Access Route
2. Lifting and Transport of Reactor Components
3. Systems Decommissioning

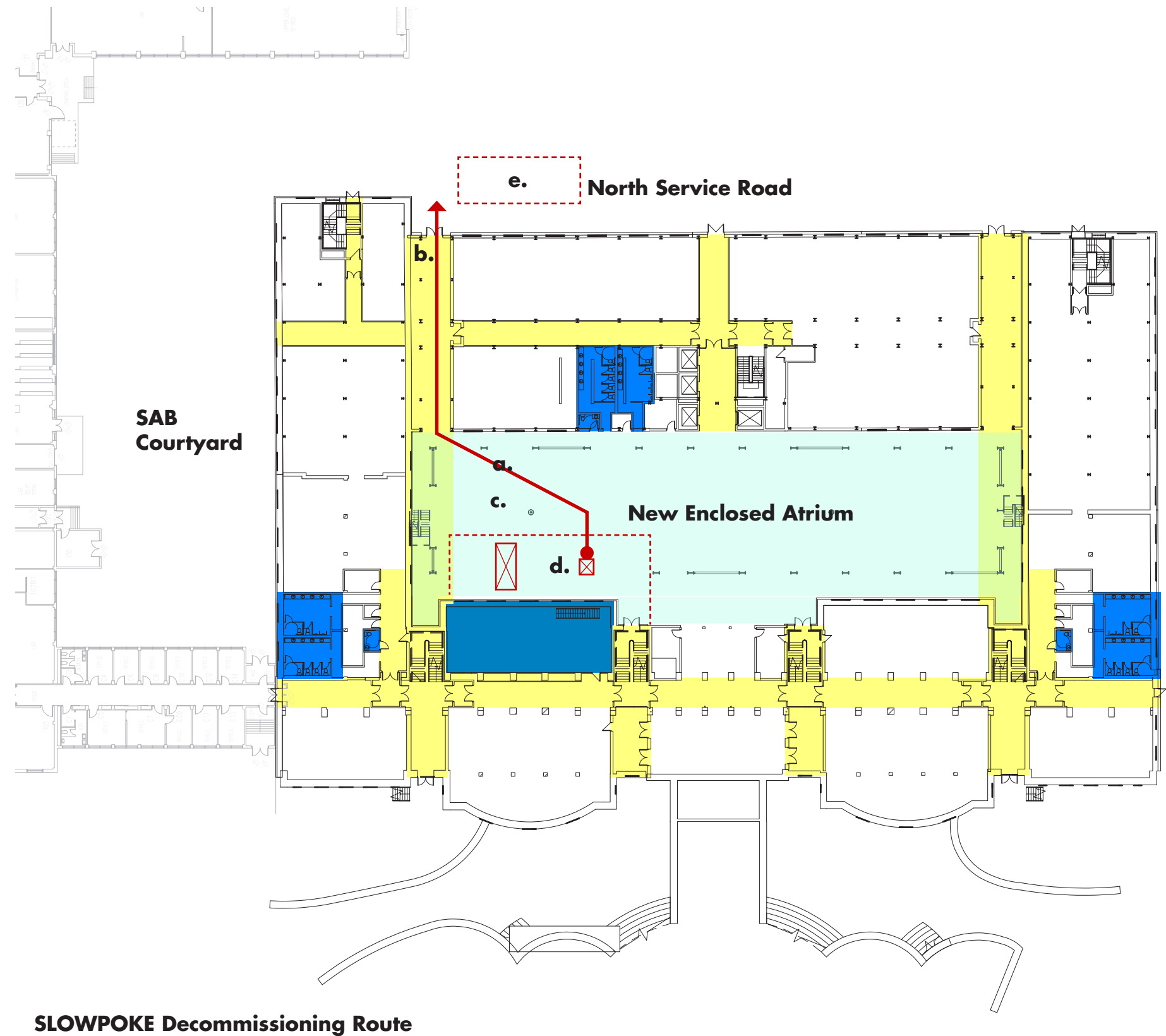
1. Access Route

The new Atrium will be enclosed and finished interior space as opposed to its current condition as exposed exterior space, however the **a)** route to remove the Reactor components will not change. Instead the route to the North service road from the Atrium interior which will now enclose the roof hatches of the SLOWPOKE Reactor Vault will be designed to accommodate moving equipment space and load requirements. New entry doors **(b)** that will close off the existing breezeway will be a pair of 1220mm wide doors that when open will provide an unobstructed width of approximately 2300mm and a height of 2400mm.

c). The floor of the Atrium will be a slab on grade for all areas outside of the SLOWPOKE Reactor Vault footprint (red dashed line in diagram to the left) and will be designed to accept the loads imposed by removal of the 7000lb Reactor core shield.

d). Floor finishes covering the SLOWPOKE access hatches will be designed for easy removal and replacement without affecting adjacent finishes.

e). Loading Zone. From a flatbed truck with a truck mounted crane parked in service road to North of Dent Pharm building off load block and tackle rigging system, gantry frame and reactor container.



SLOWPOKE Decommissioning Route

2. Lifting and Transport

There are several components to be lifted out from (and/or back into) the Vault as well as the access hatches themselves which are pre-cast concrete:

1. Reactor Container Assembly: Overall length: 5.270m (Lower Section: 0.829m, Upper Section 4.445m in length, Wall thickness 0.953cm)
2. Fuel/core and Fuel Shield (approx. 7000lbs and 49-1/2"x 60" high)
3. Small Roof Access Hatch: Single pre-cast unit approx. 60" square
4. Large Roof Access Hatch: Multiple pre-cast units approx. 9'x1'9"x5" thick

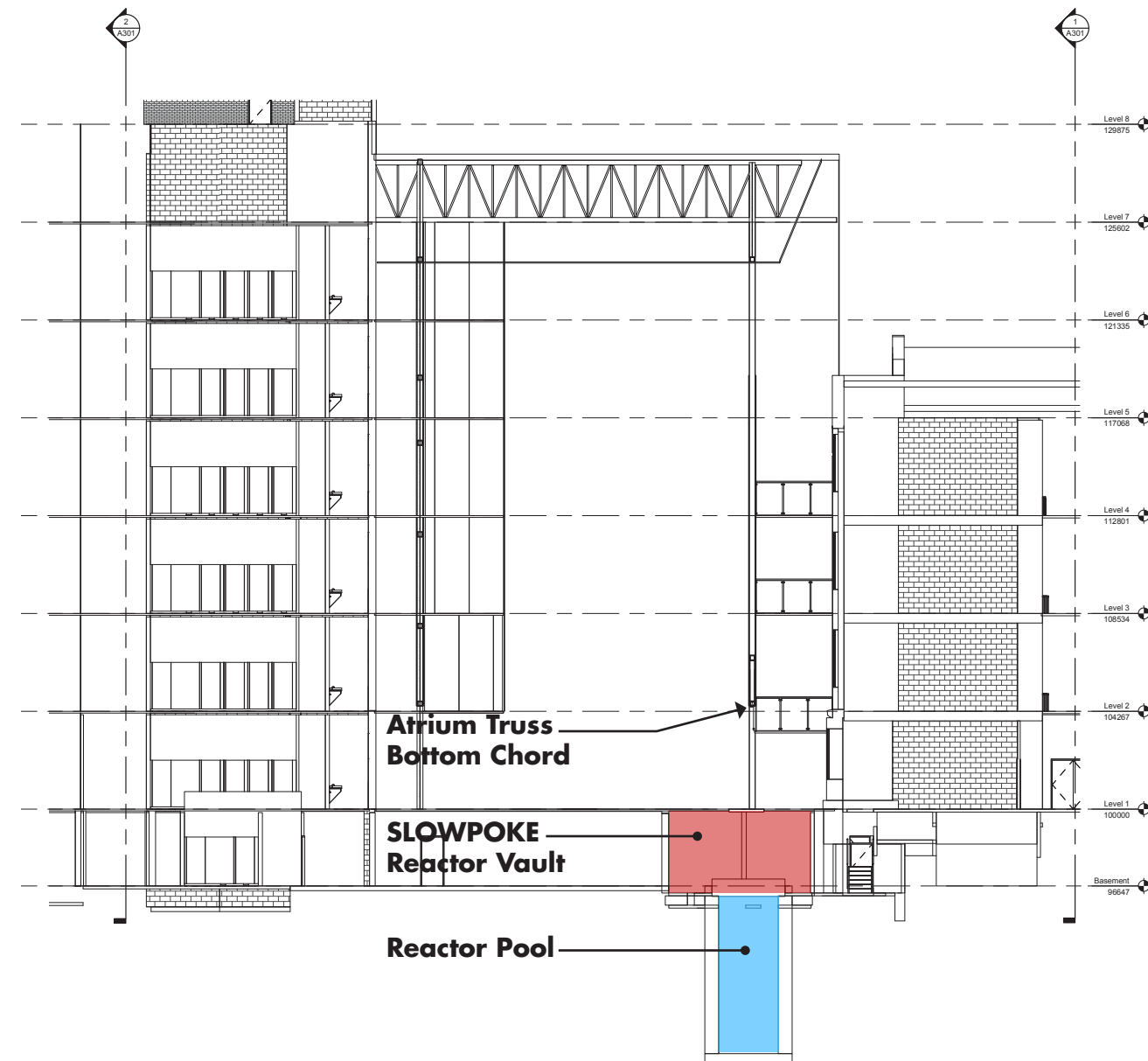
The Sequence of removal as understood from consultation with Dr. John Duke is as follows:

1. Roof Hatch removal
2. Removal of Concrete shields over tank
3. Lower steel Fuel Shield into tank
4. Unbolt the Reactor Container Lower Assembly from the Reactor Container Upper Assembly and swing Lower Assembly to the side under water.
5. Load the Fuel Shield with the fuel/core and seal.
6. Lift shield "flask" out of the Pool and Reactor Vault.
7. Lift Upper Reactor Container section out of the pool and out of the Vault through the small access hatch and then back into the Vault through the large access hatch horizontally so that it can be loaded with other radioactive components.
8. Lift Lower Reactor Container Assembly out of the Pool and the Vault
9. Lift Upper Reactor Container Assembly loaded with remaining radioactive components secured out through the large access hatch.
10. Reinstall concrete shields over the pool
11. Reinstall access hatches and floor finishes.

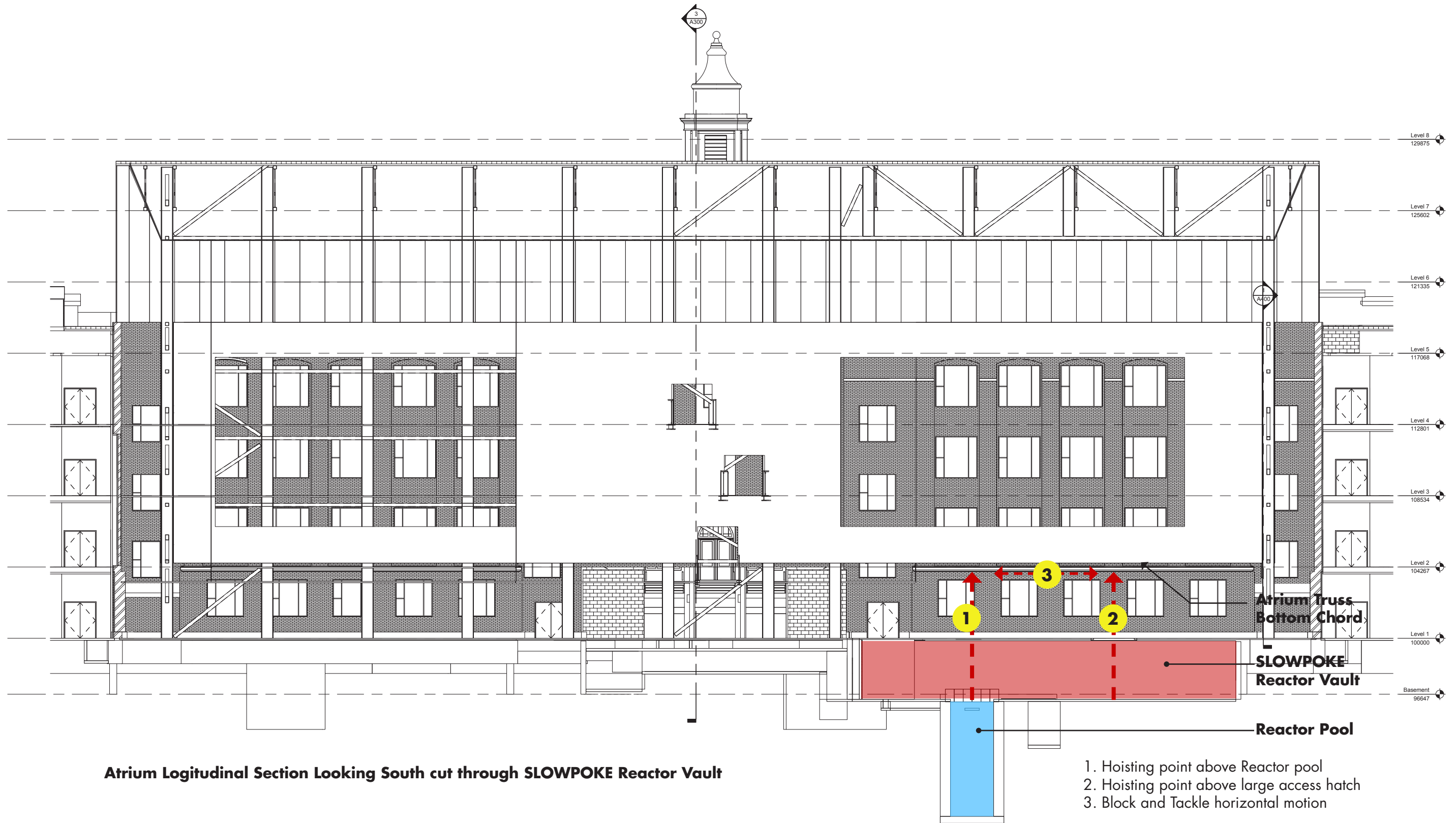
Lifting is proposed to be done with a block and tackle system that is capable of rolling along the bottom flange of the Atrium truss structure that is directly above the access hatches. The bottom flange of the lowest beam will be approximately 5.5m above the finished floor of the Atrium (and access hatches) allowing 1.0m for block and tackle assembly and cable hook-ups. Once each piece is lifted out of the tank it can be manoeuvred West to a waiting air pallet transporter and moved along the floor of the atrium to a waiting truck at the North service road loading area.

As there is no North-South movement capability in this design it is proposed that a portable gantry system be used to remove the large access hatch pre-cast panels out of the way that would straddle the larger 8 foot wide hatch opening and be capable of being moved North onto protected floor area away from the removal route and operations.

Once Reactor components are removed in their entirety the hatches and floor finishes can be reinstated.



Cross Section Through Atrium and SLOWPOKE



Atrium Logitudinal Section Looking South cut through SLOWPOKE Reactor Vault

- 1. Hoisting point above Reactor pool
- 2. Hoisting point above large access hatch
- 3. Block and Tackle horizontal motion

3. Systems Decommissioning

Mechanical

The new dedicated SLOWPOKE mechanical systems and services have been designed and laid out in a manner to allow ease of removal when the SLOWPOKE program may be discontinued. All dedicated SLOWPOKE mechanical systems and services should be removed entirely from the building. Interference with regard to other building mechanical systems has been minimized to a point where building operation is unchanged.

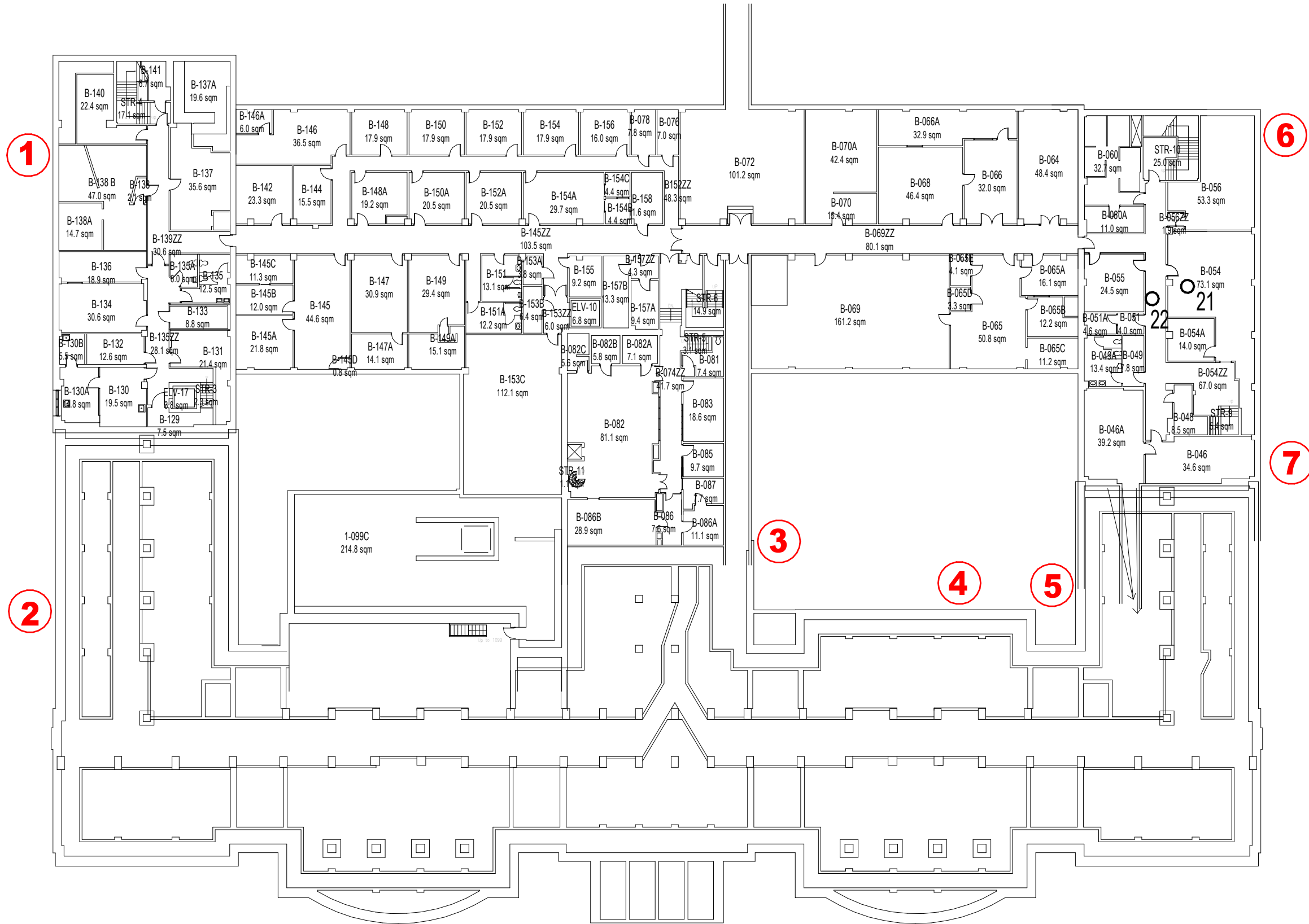
Re-programing of the SLOWPOKE space has been accommodated through the base building mechanical systems with an allowance for the space to be used as office or support type spaces.

Electrical Decommissioning

- For the transition between the temporary slow poke power to permanent power system it is anticipate that two systems be installed and cables pulled to branch panel to for a seamless transition.
- It is anticipate that an approximate 4-6 hour shut down of panels will be required to facilitate the permanent transition.
- All electrical systems related to Reactor room and Main Floor lab to be removed back to source.
- Associated monitoring system interface to RCMS system to be removed.
- Any electrical equipment in good condition to be turned over to the Owner.
- Fire alarm system devices to be removed as required within existing spaces.
- All lighting to be removed and turned over to the University.



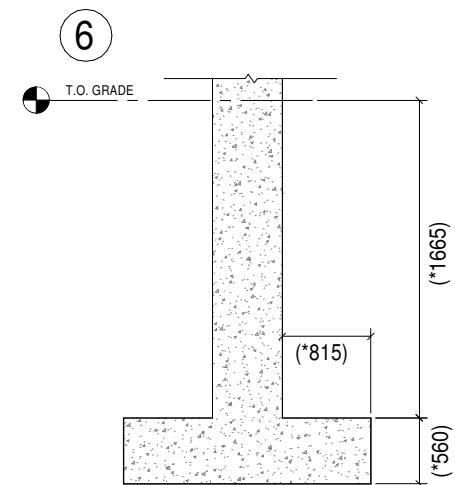
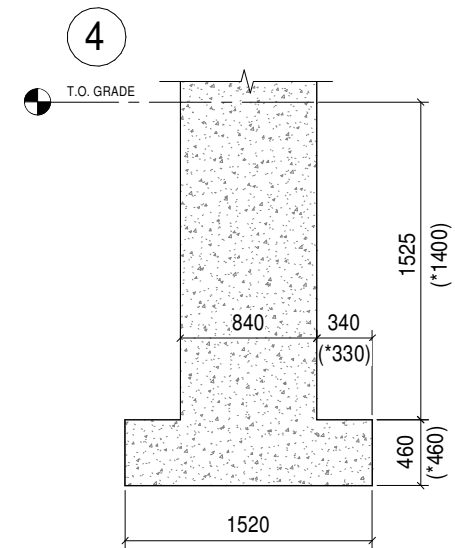
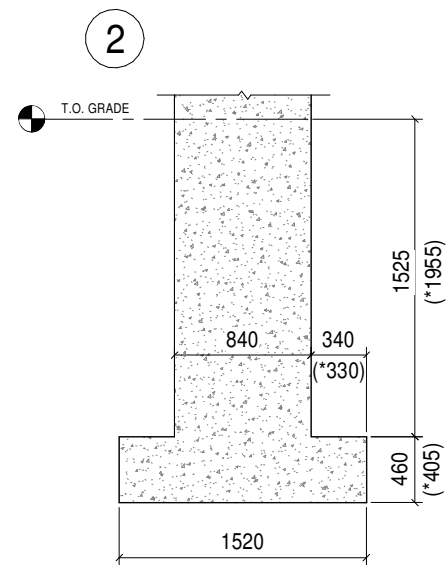
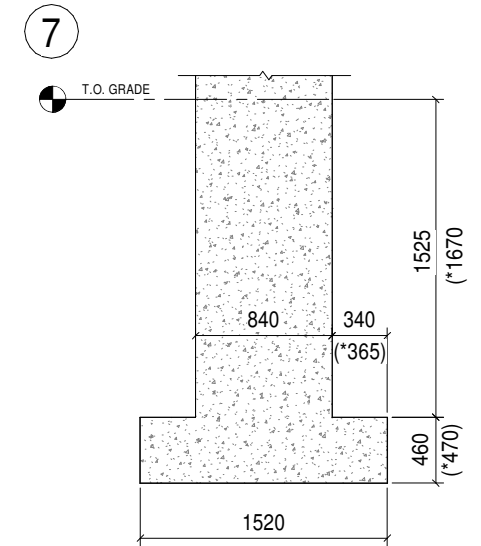
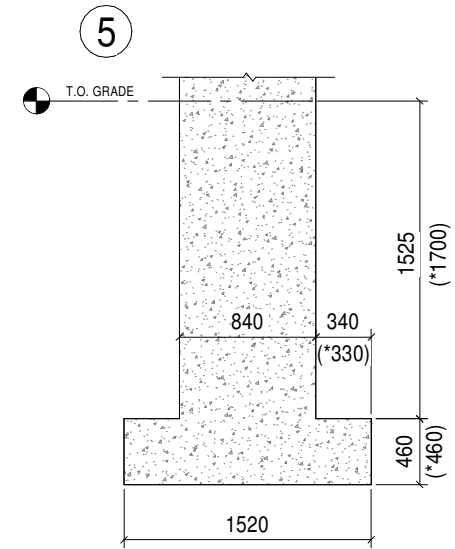
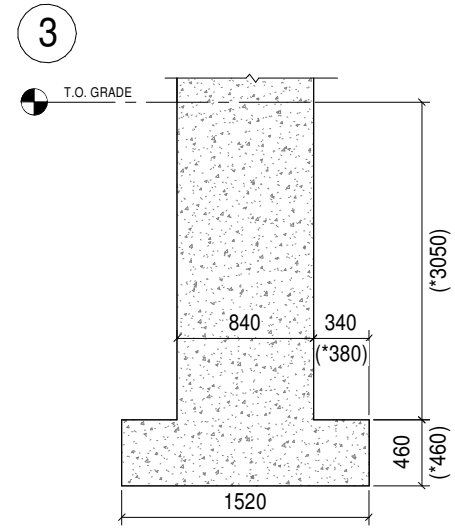
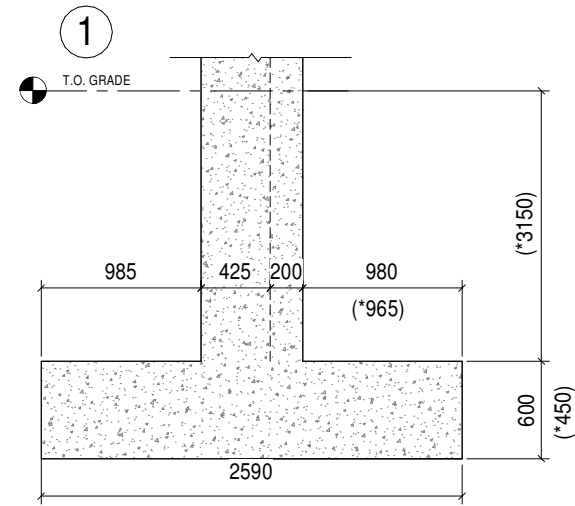
- *Structural Drawings*



1. Foundation Plan

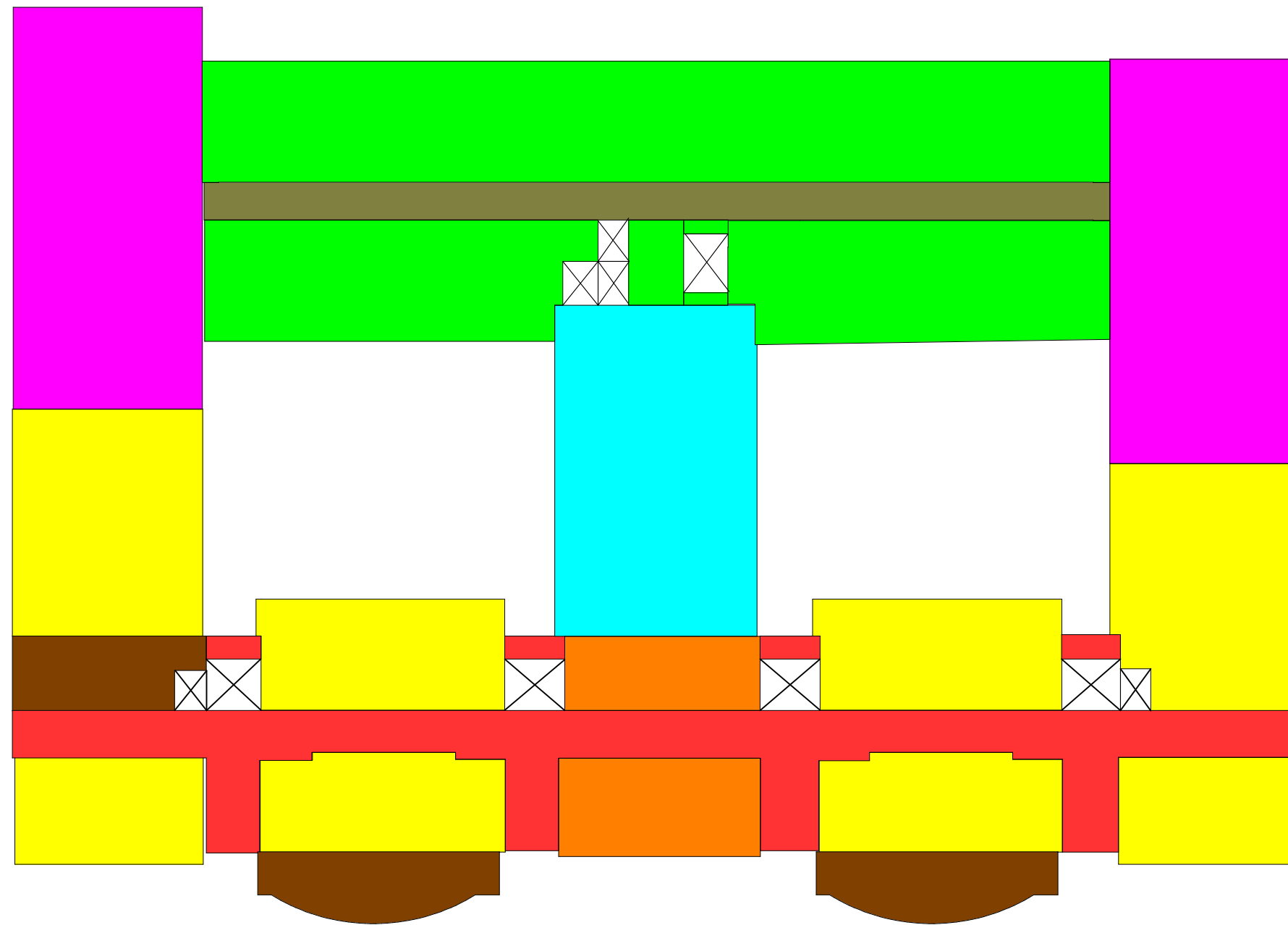
S. Structural Drawings





*DIMENSION MEASURED ON SITE

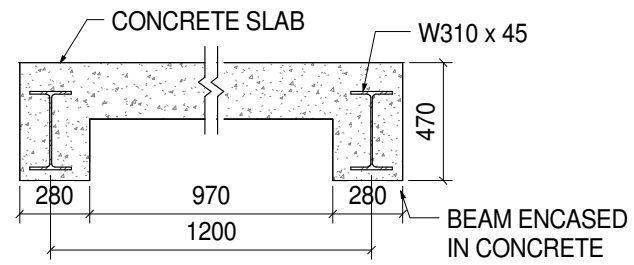
2. Foundation Sections



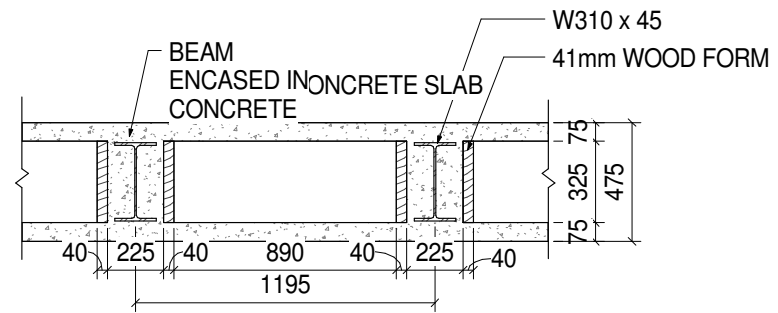
LEGEND

- FLOOR TYPE 1
- FLOOR TYPE 2
- FLOOR TYPE 3
- FLOOR TYPE 4
- FLOOR TYPE 5
- FLOOR TYPE 6
- FLOOR TYPE 7
- FLOOR TYPE 8
- MAJOR OPENINGS IN FLOOR

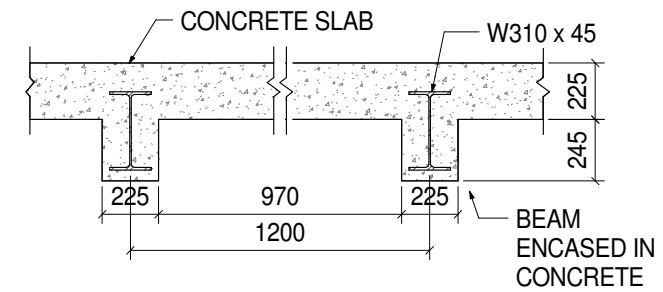
FLOOR TYPE 1



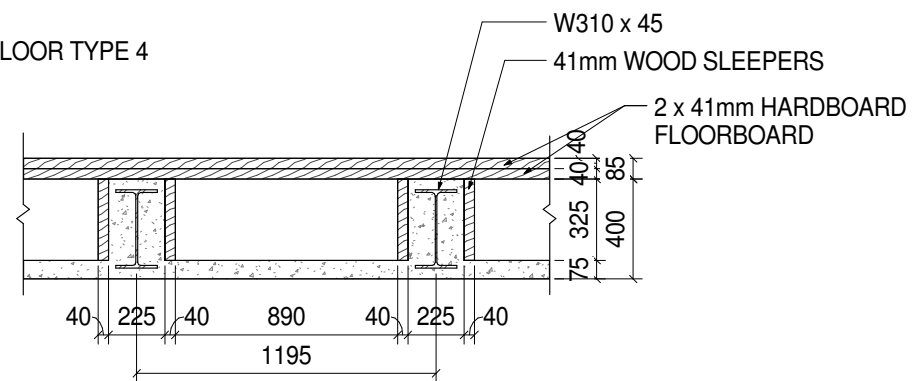
FLOOR TYPE 2



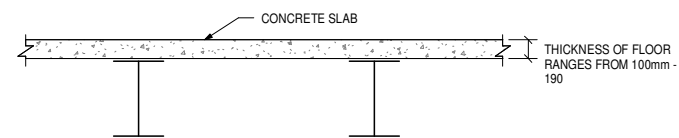
FLOOR TYPE 3



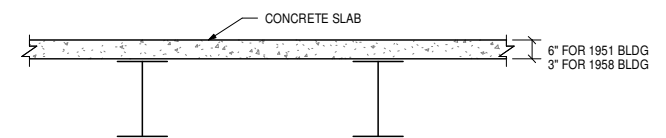
FLOOR TYPE 4



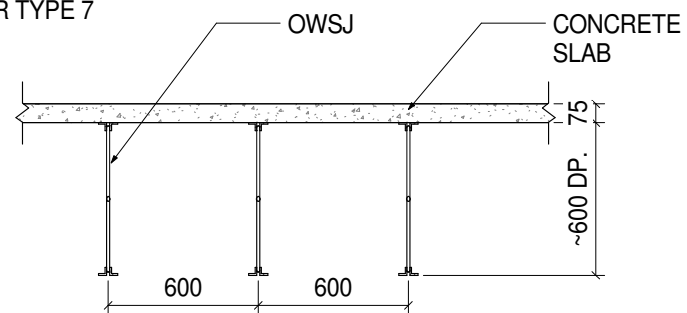
FLOOR TYPE 5



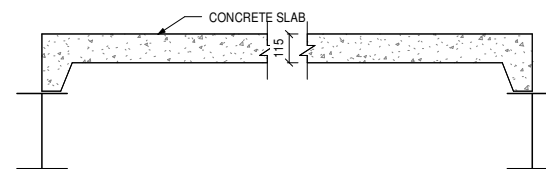
FLOOR TYPE 6



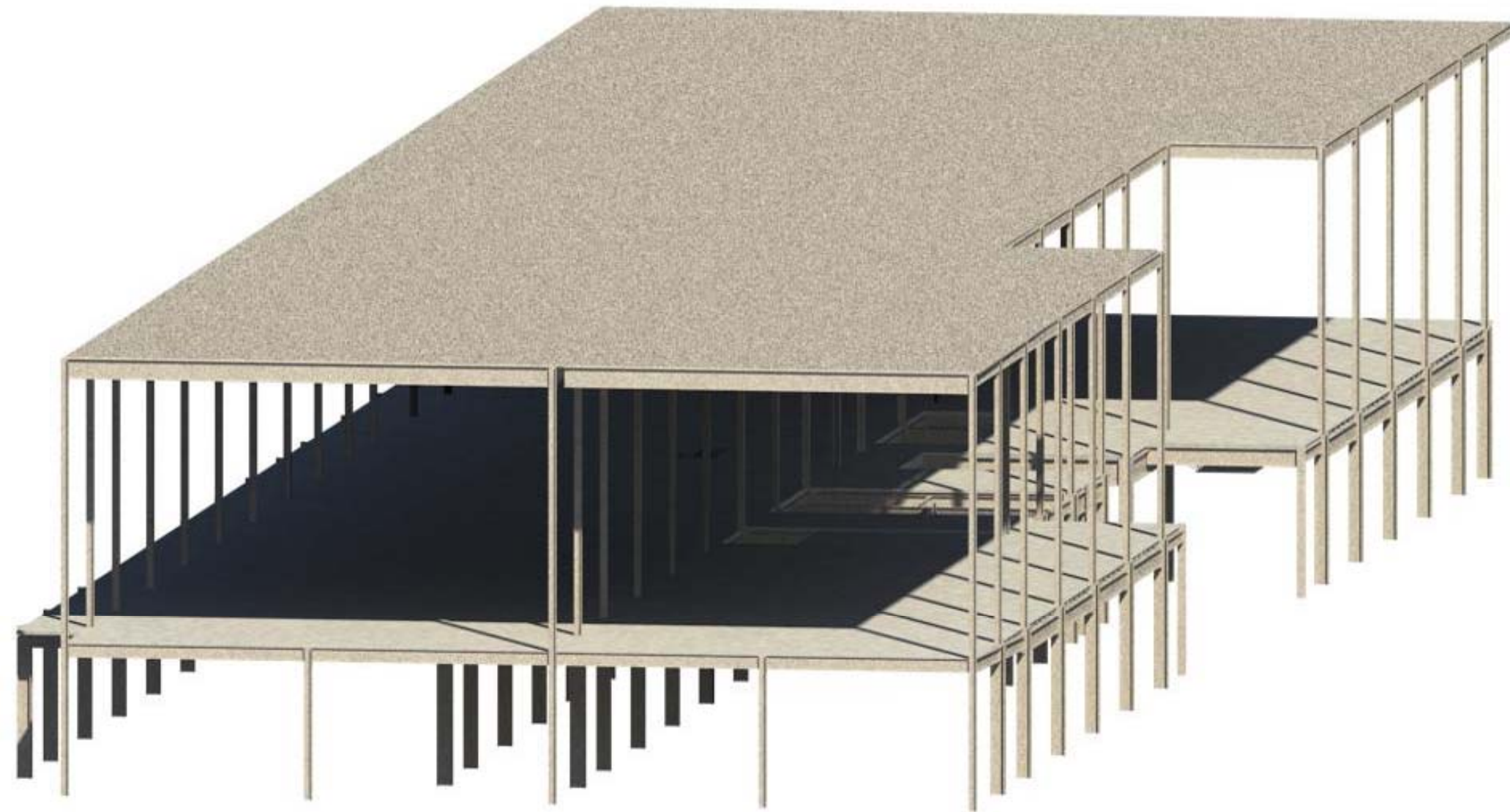
FLOOR TYPE 7



FLOOR TYPE 8

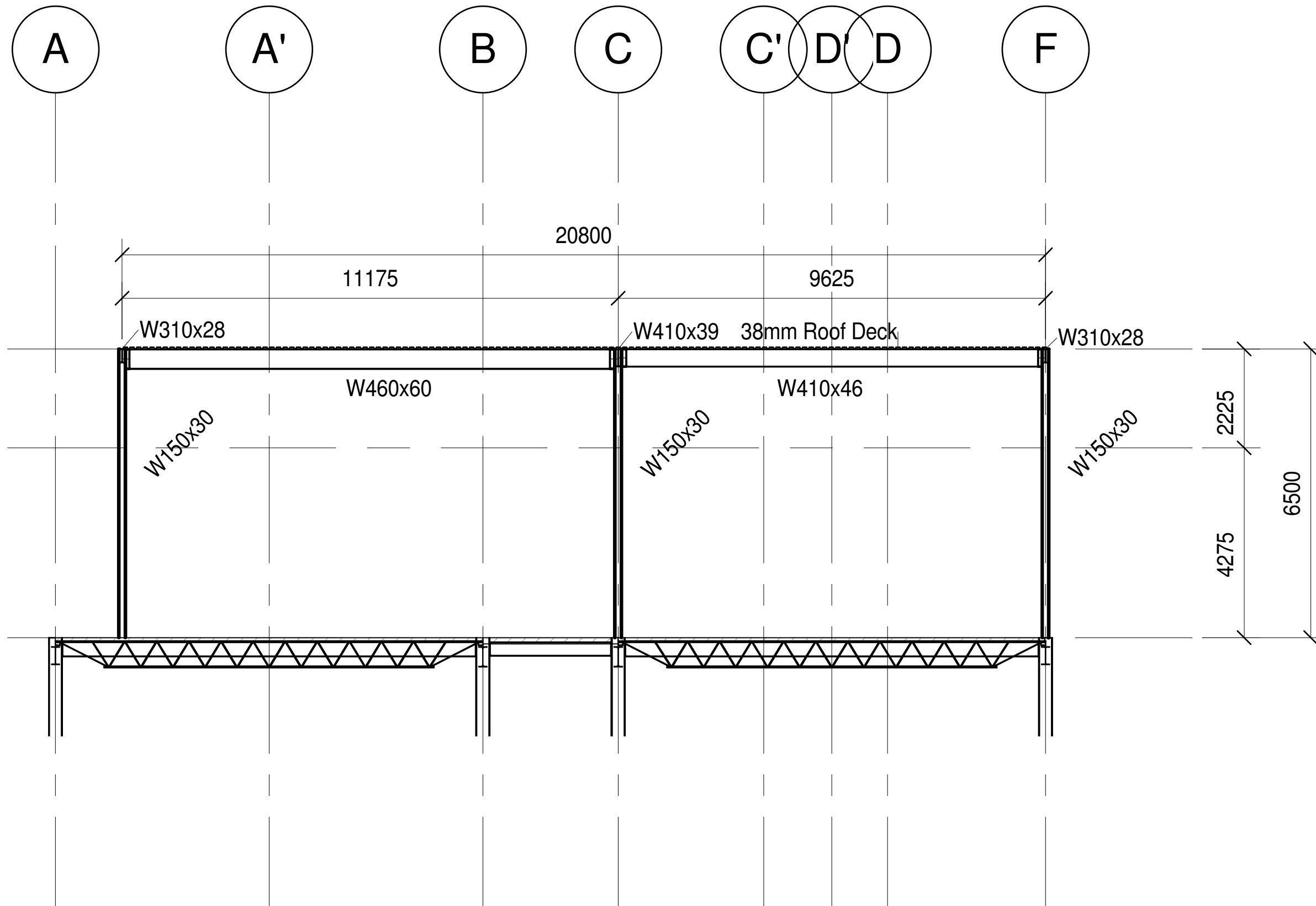


4. Floor Type Sections

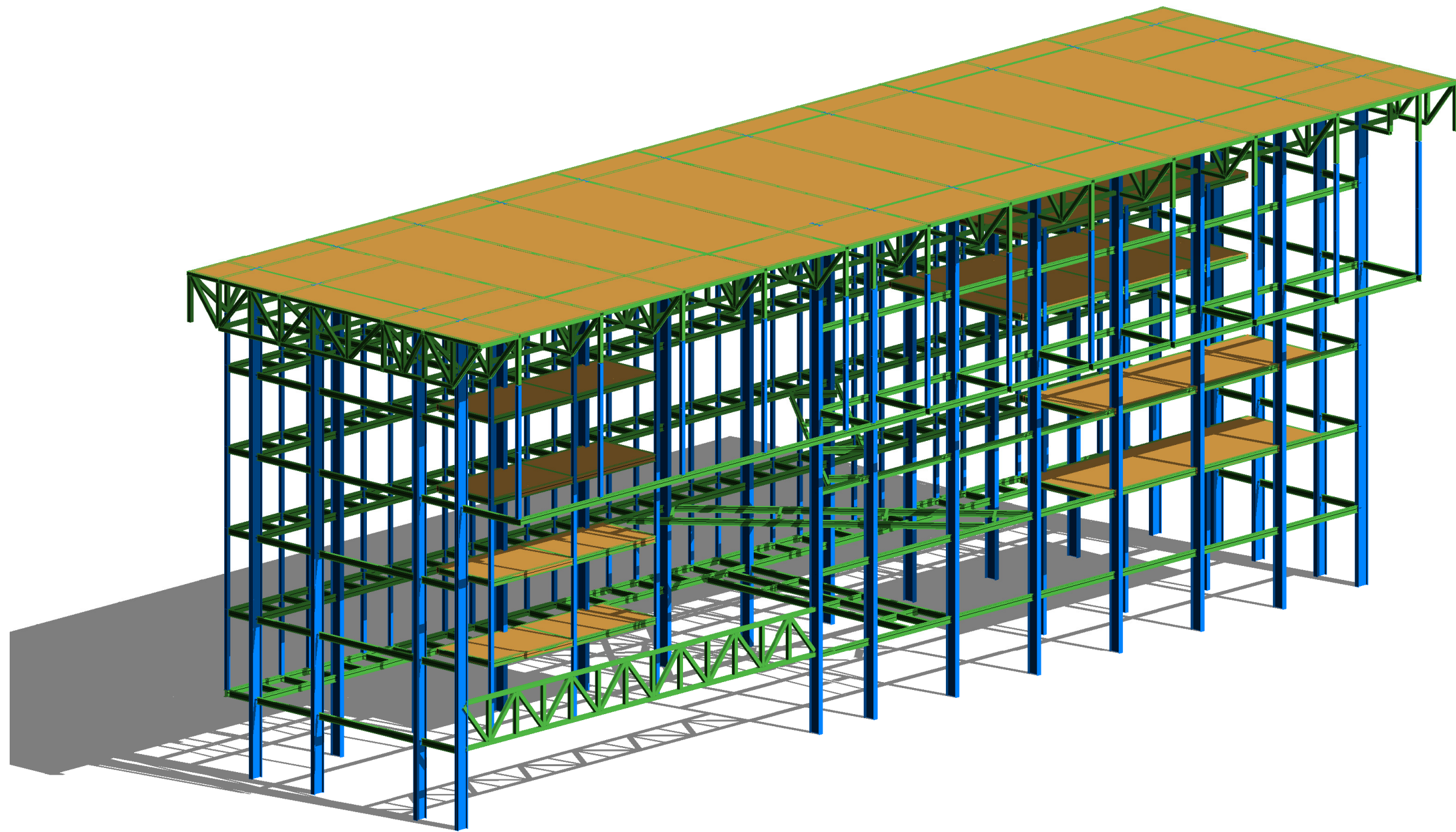


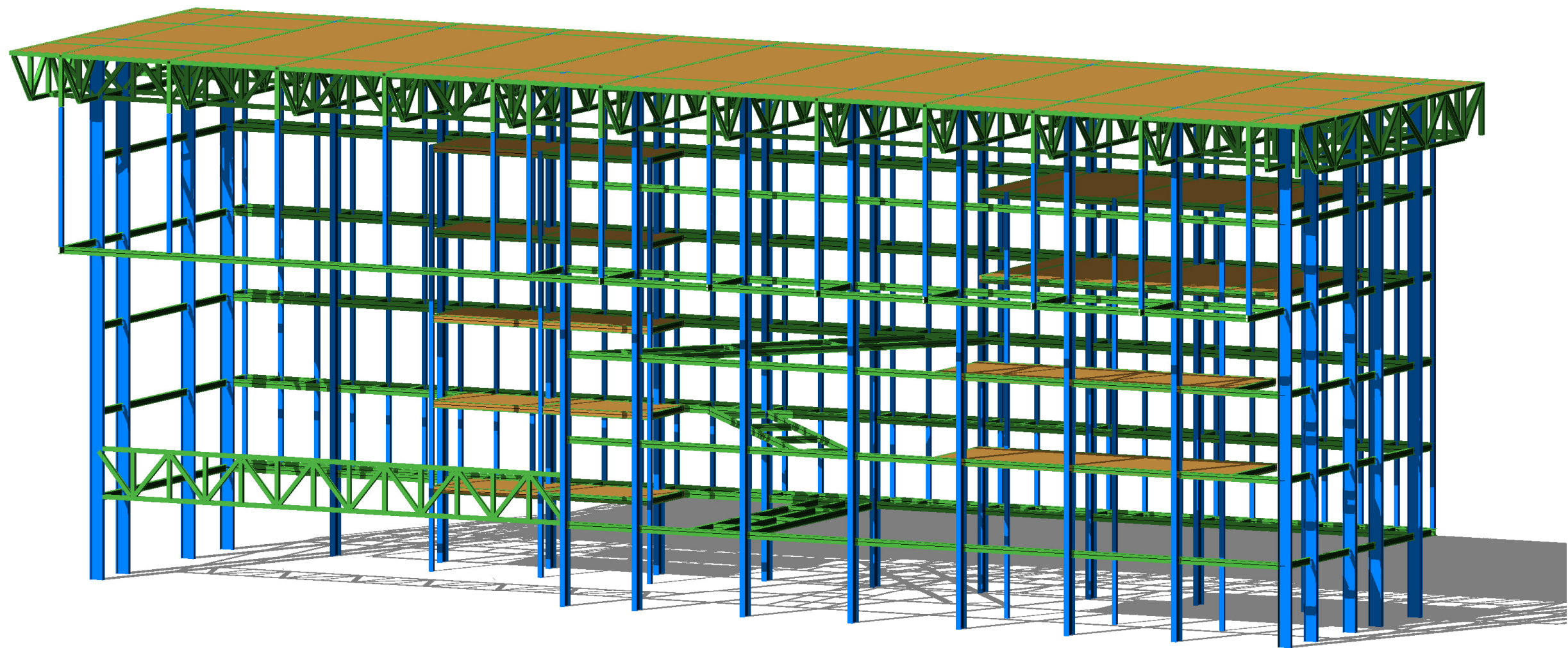
5. Penthouse Render

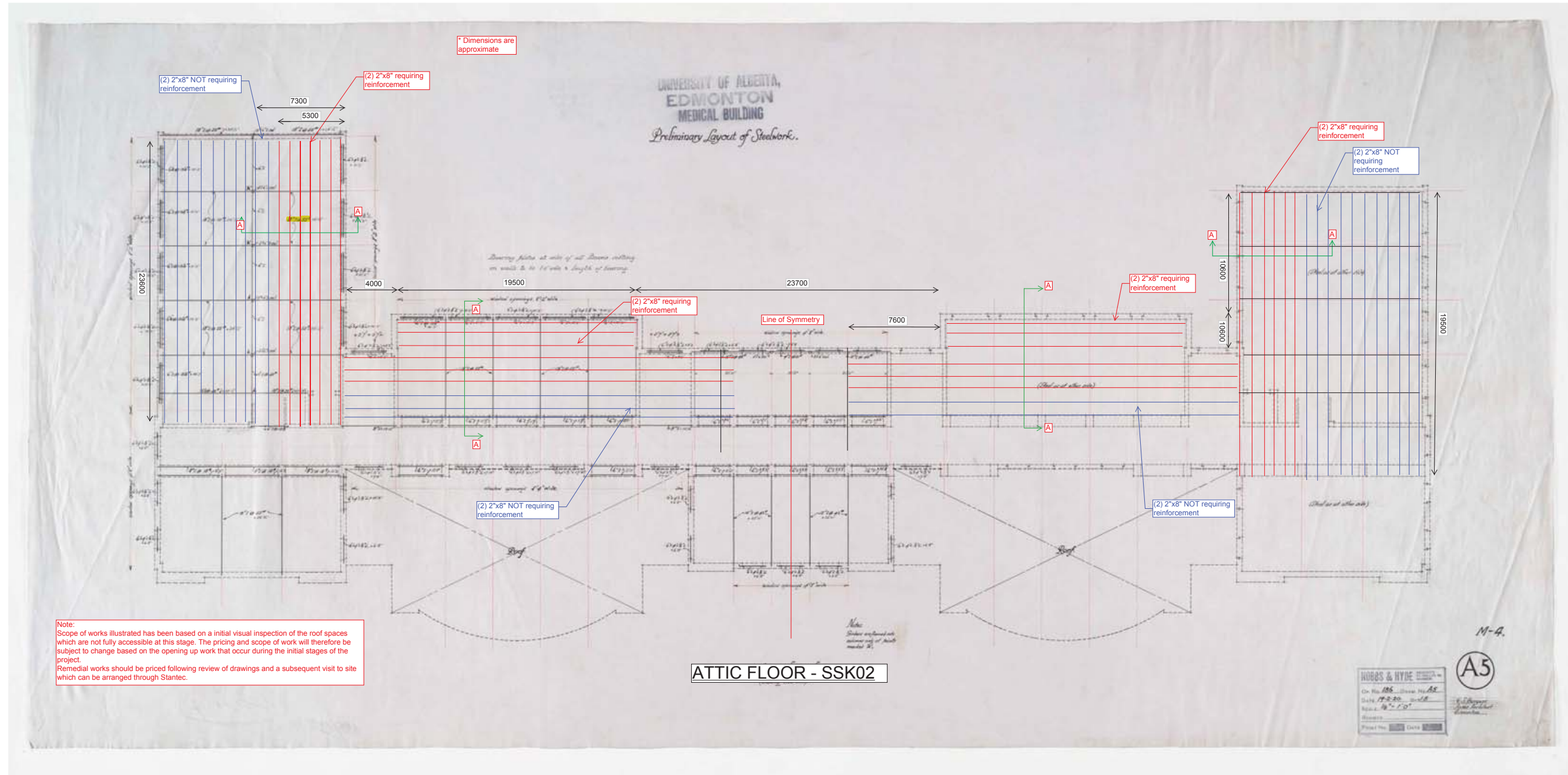




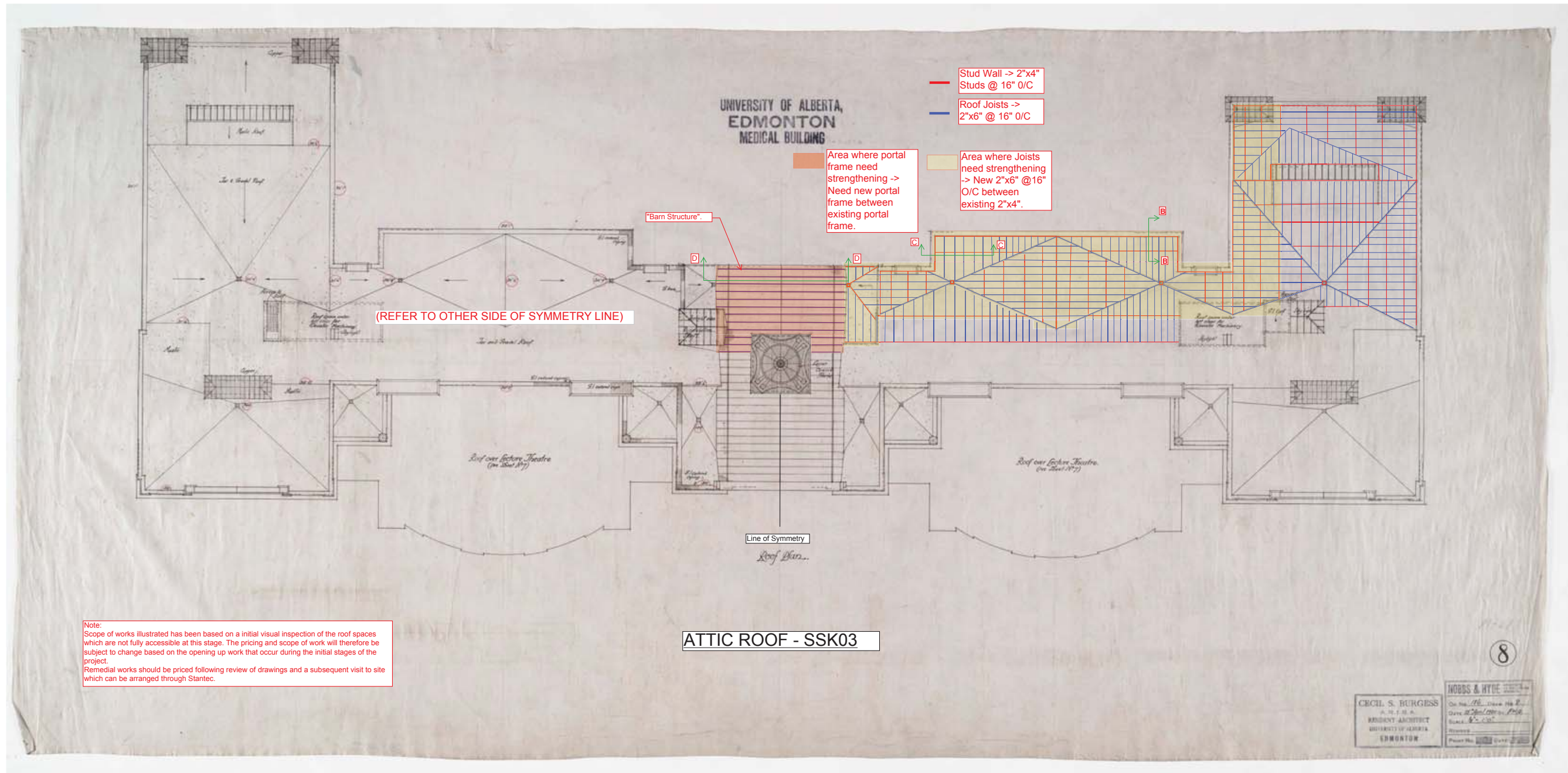
6. Mechanical Penthouse Section



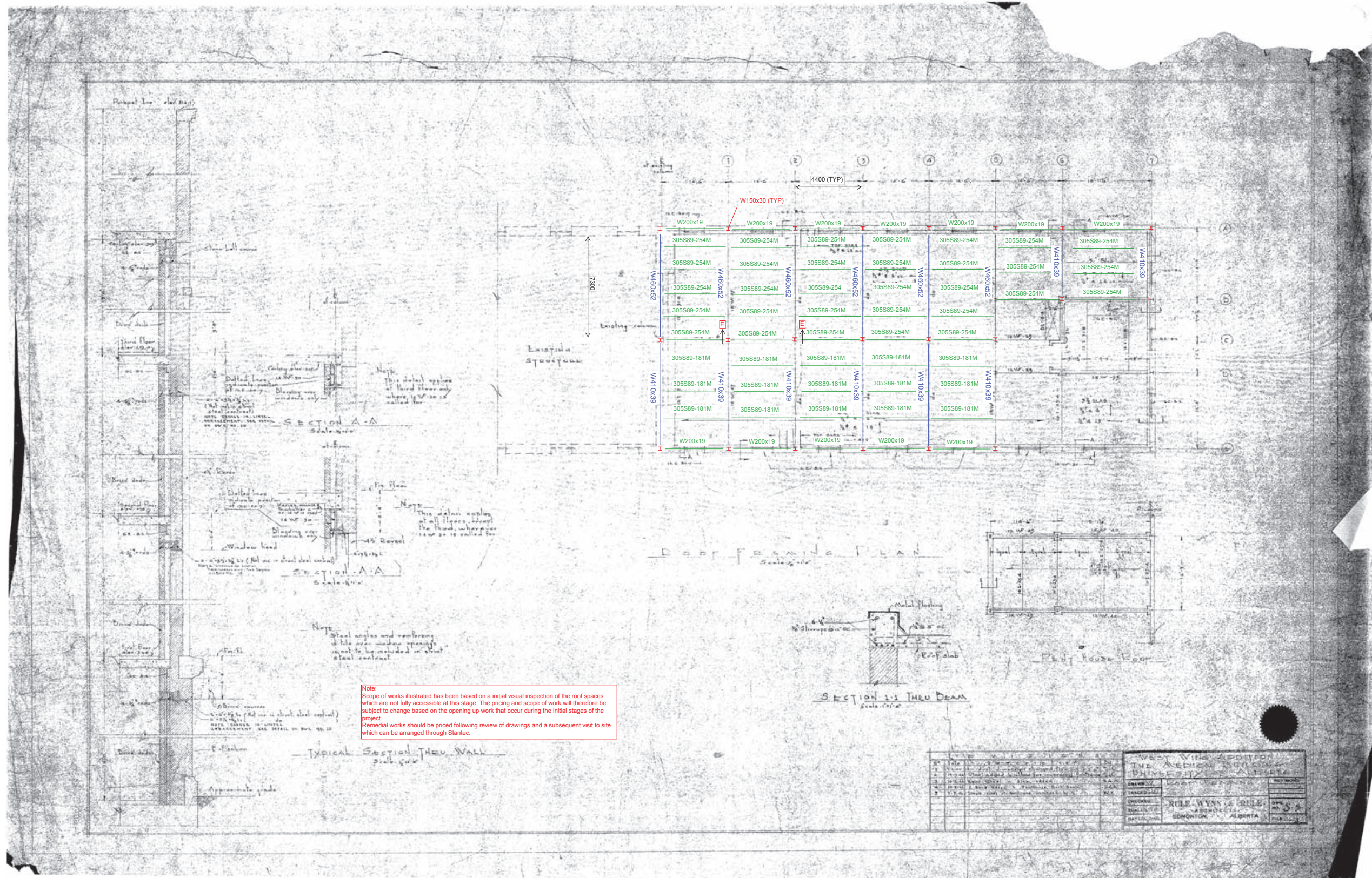




S. Structural Drawings



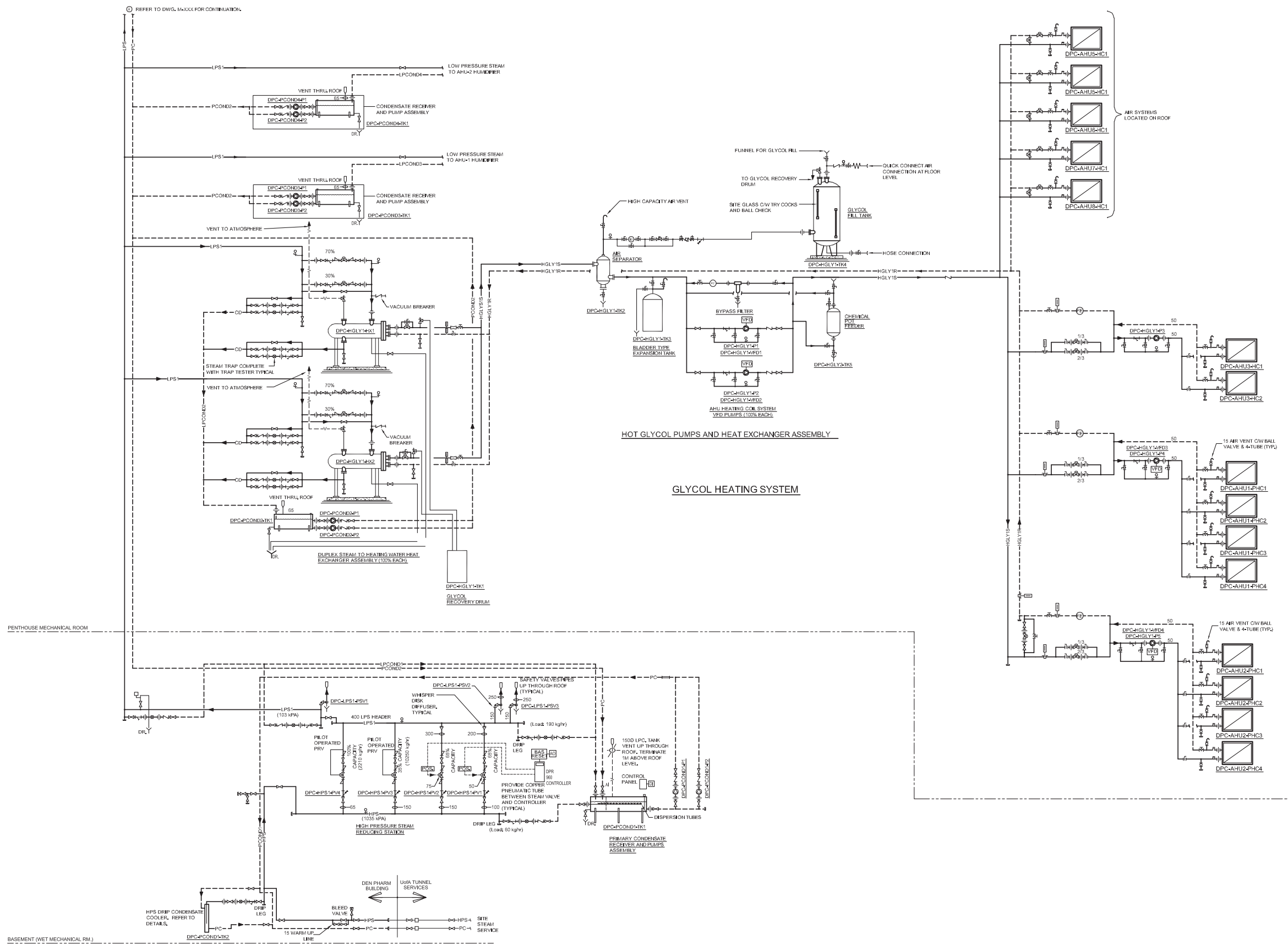
10. 1920s Attic Roof Remedial Plan



S. Structural Drawings

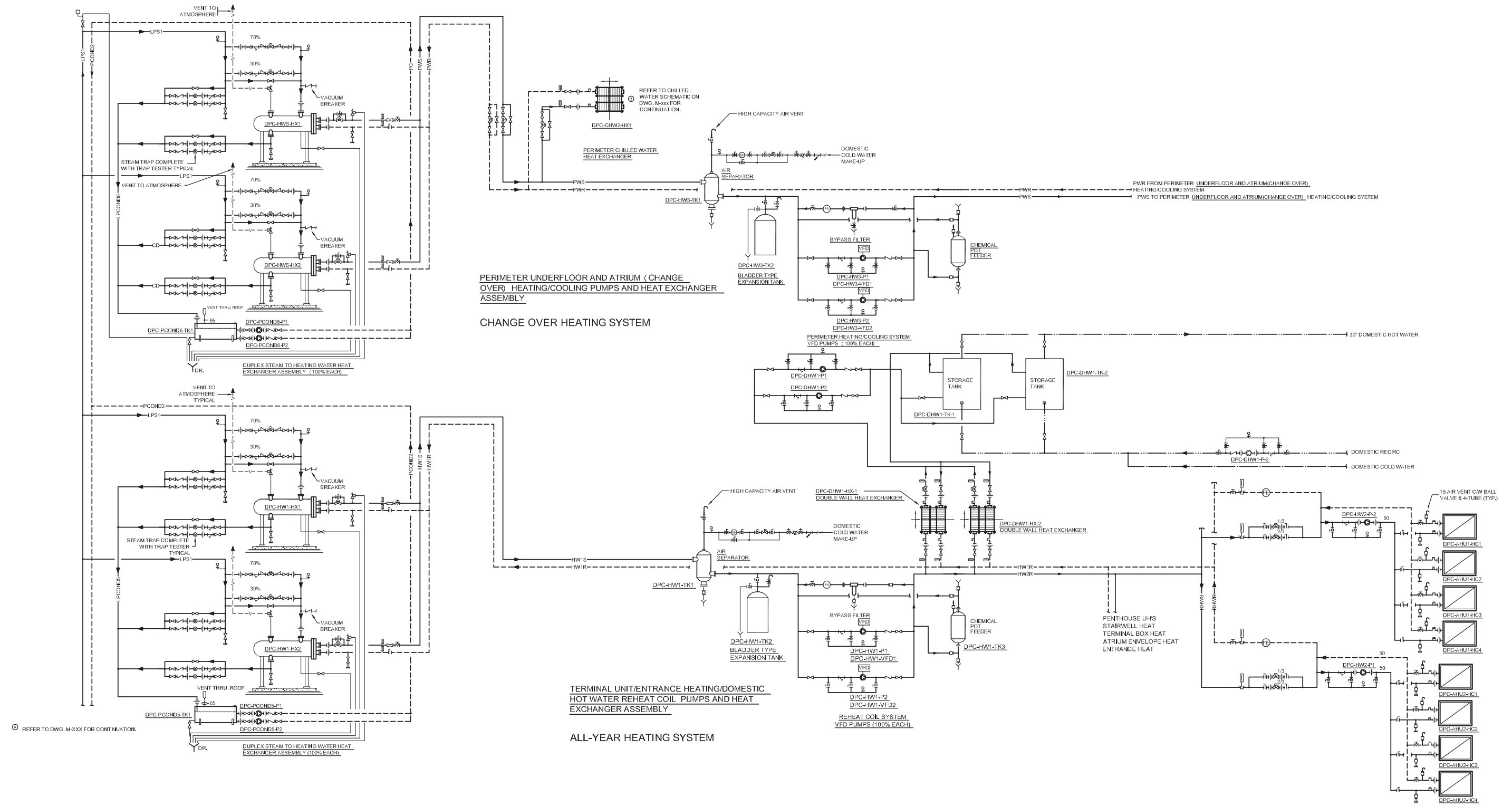


- *Mechanical Drawings*
- *Preliminary Mechanical Equipment List*
- *Mechanical Specification Outline*

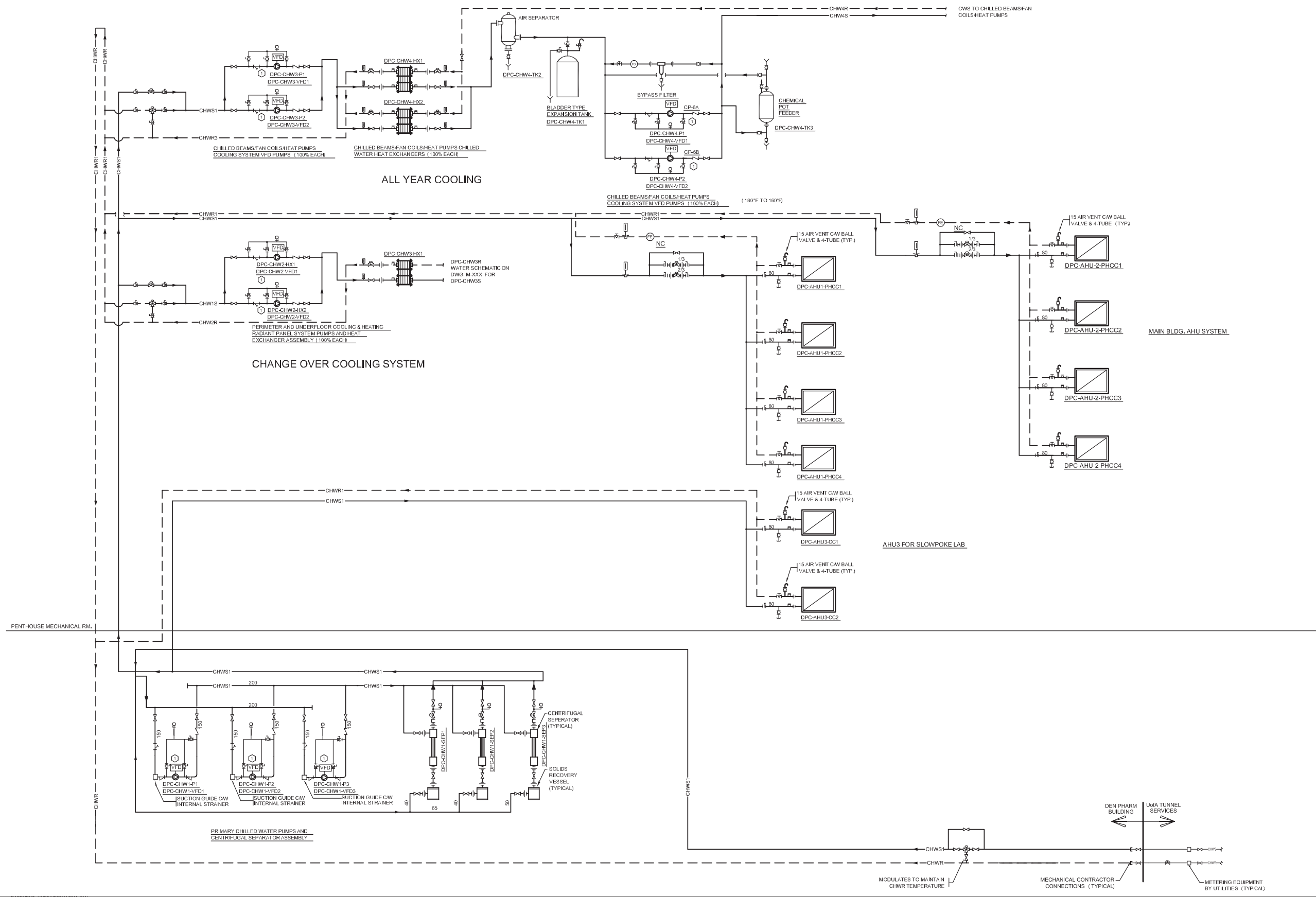


1. Steam/Hot Water System Schematic (1)



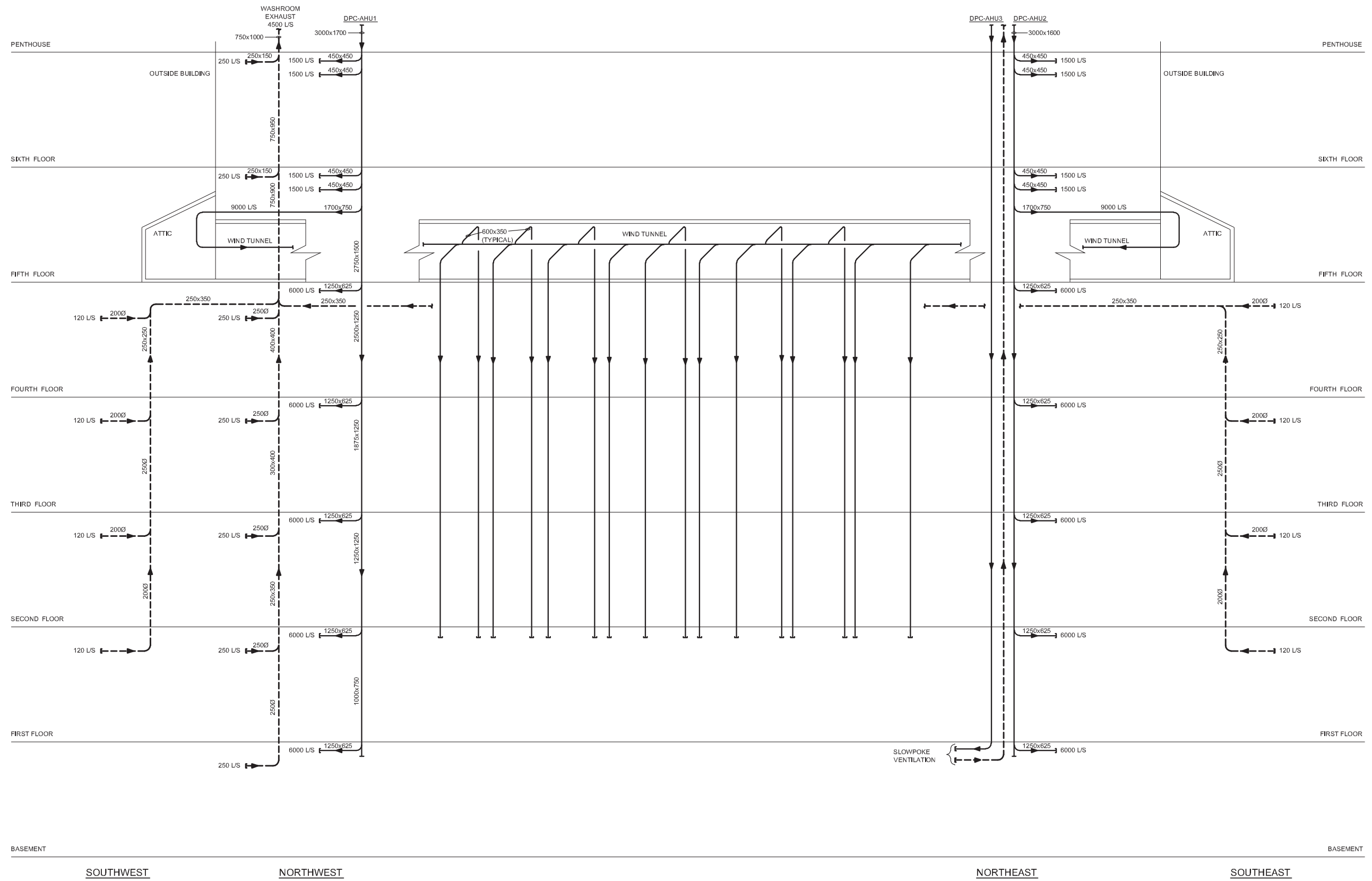


2. Steam/Hot Water System Schematic (2)



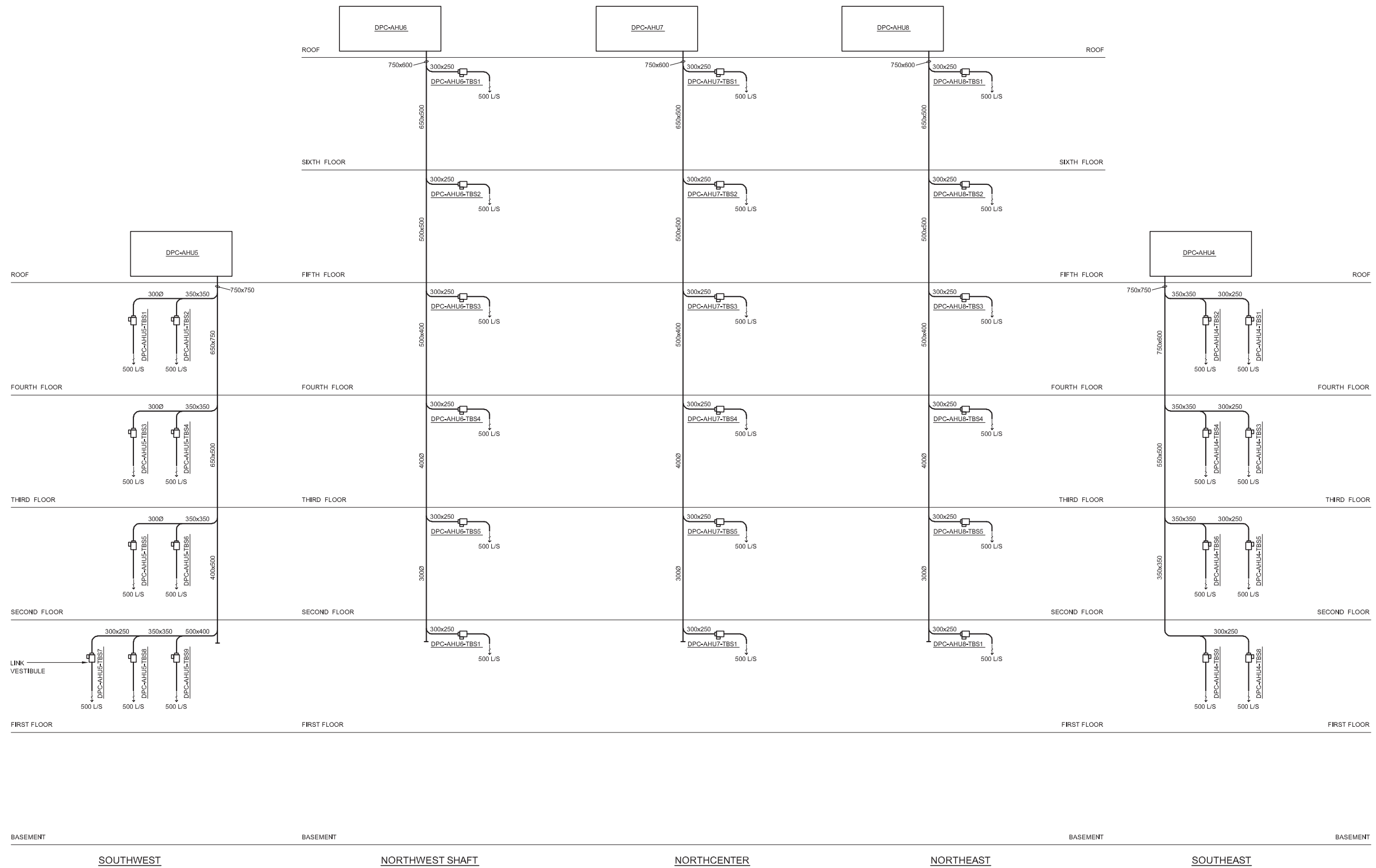
3. Chilled Water System Schematic





VENTILATION RISERS

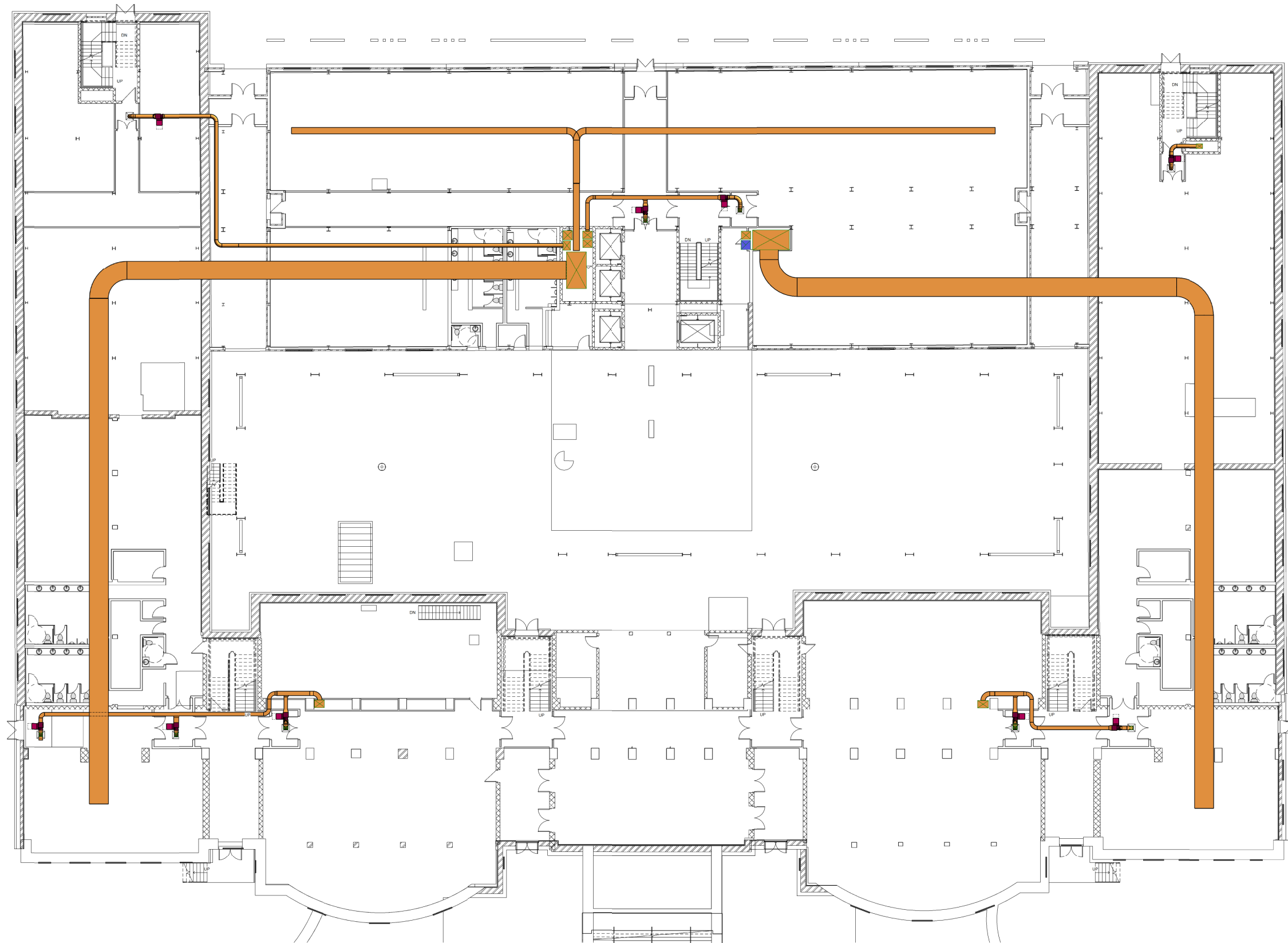
4. Building Ventilation Schematic



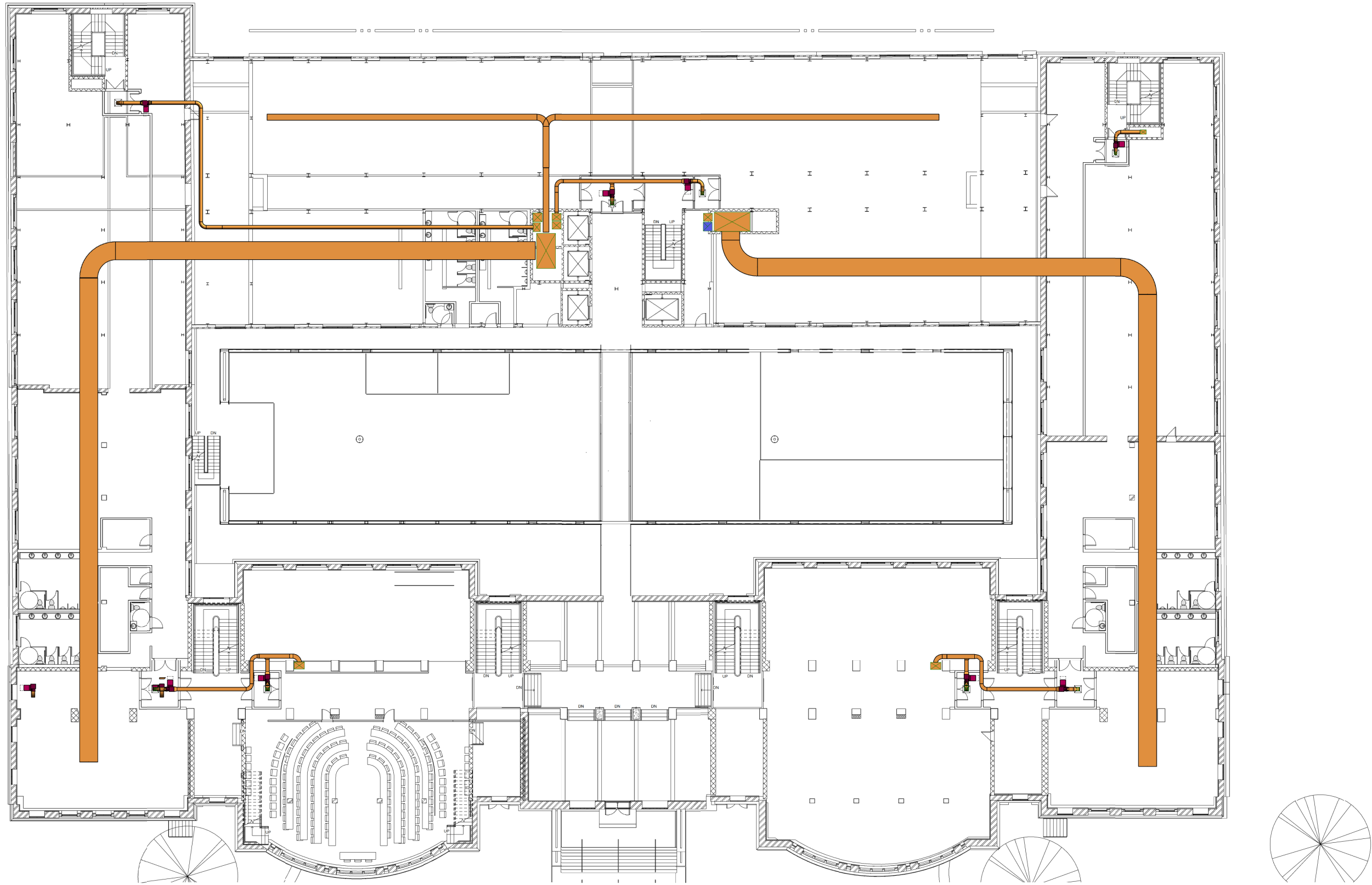
VESTIBULE PRESSURIZATION RISERS

5. Vestibule Pressurization Schematic





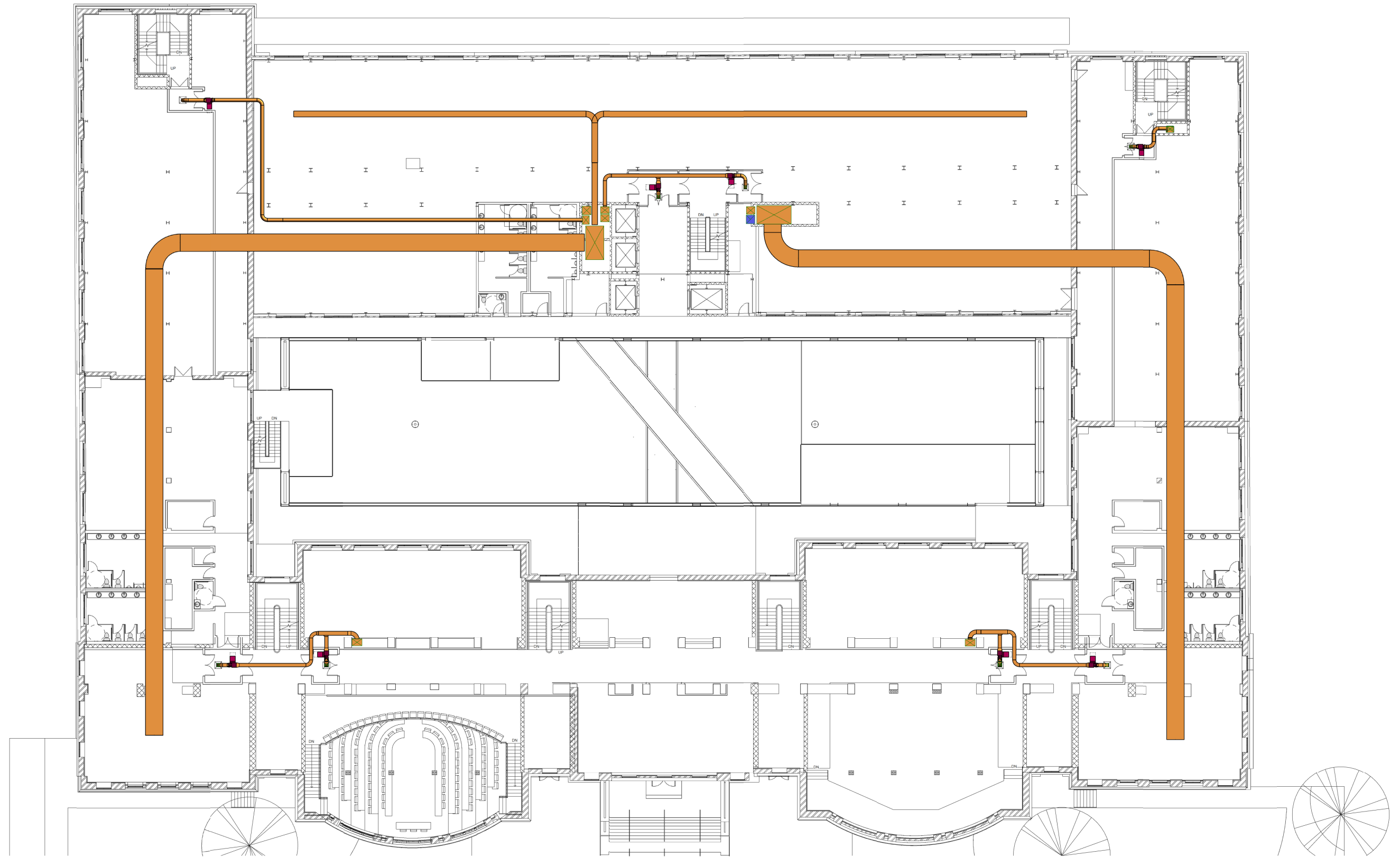
6. Level 1 – Ventilation Distribution



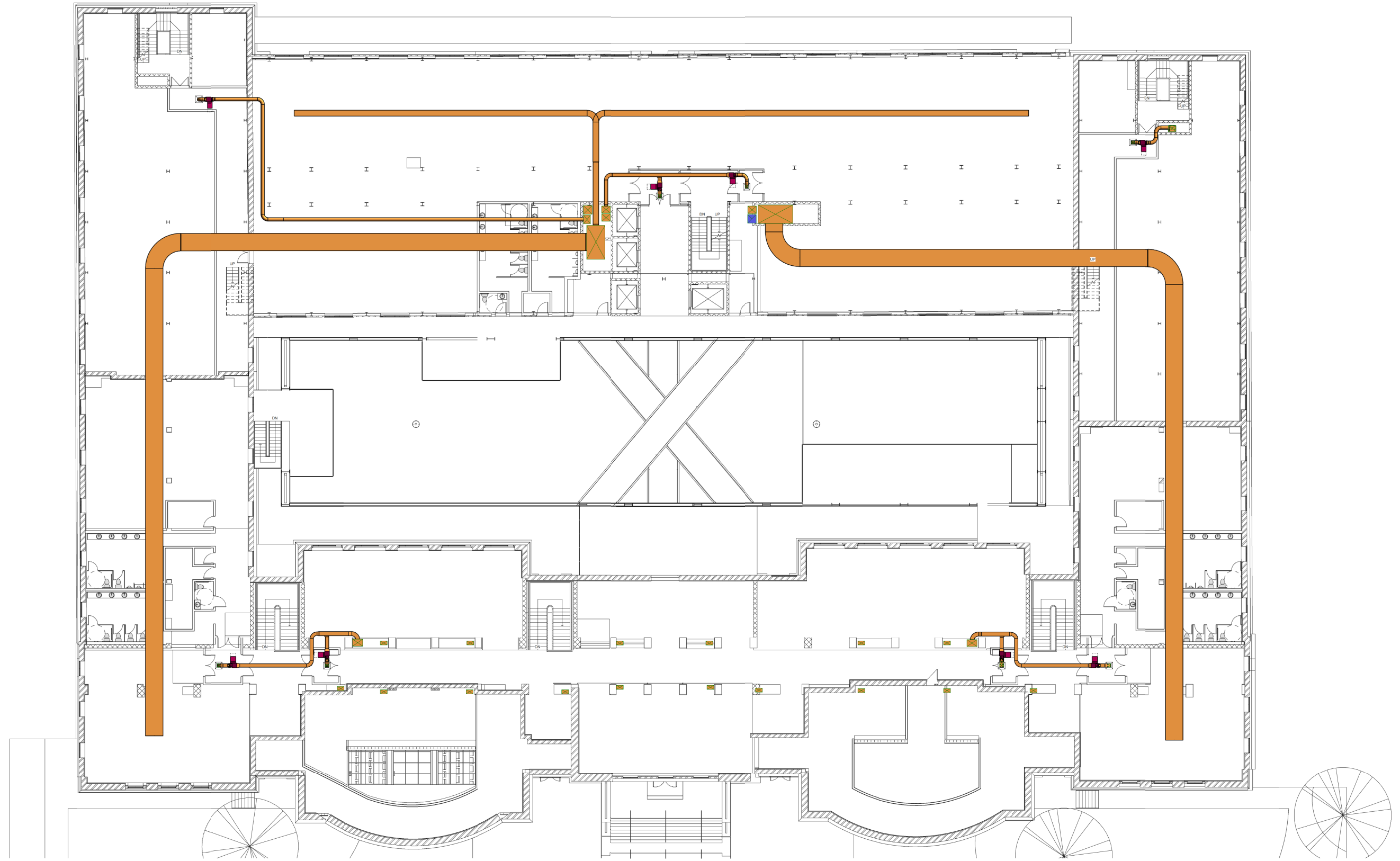
7. Level 2 – Ventilation Distribution



M1. Mechanical Drawings



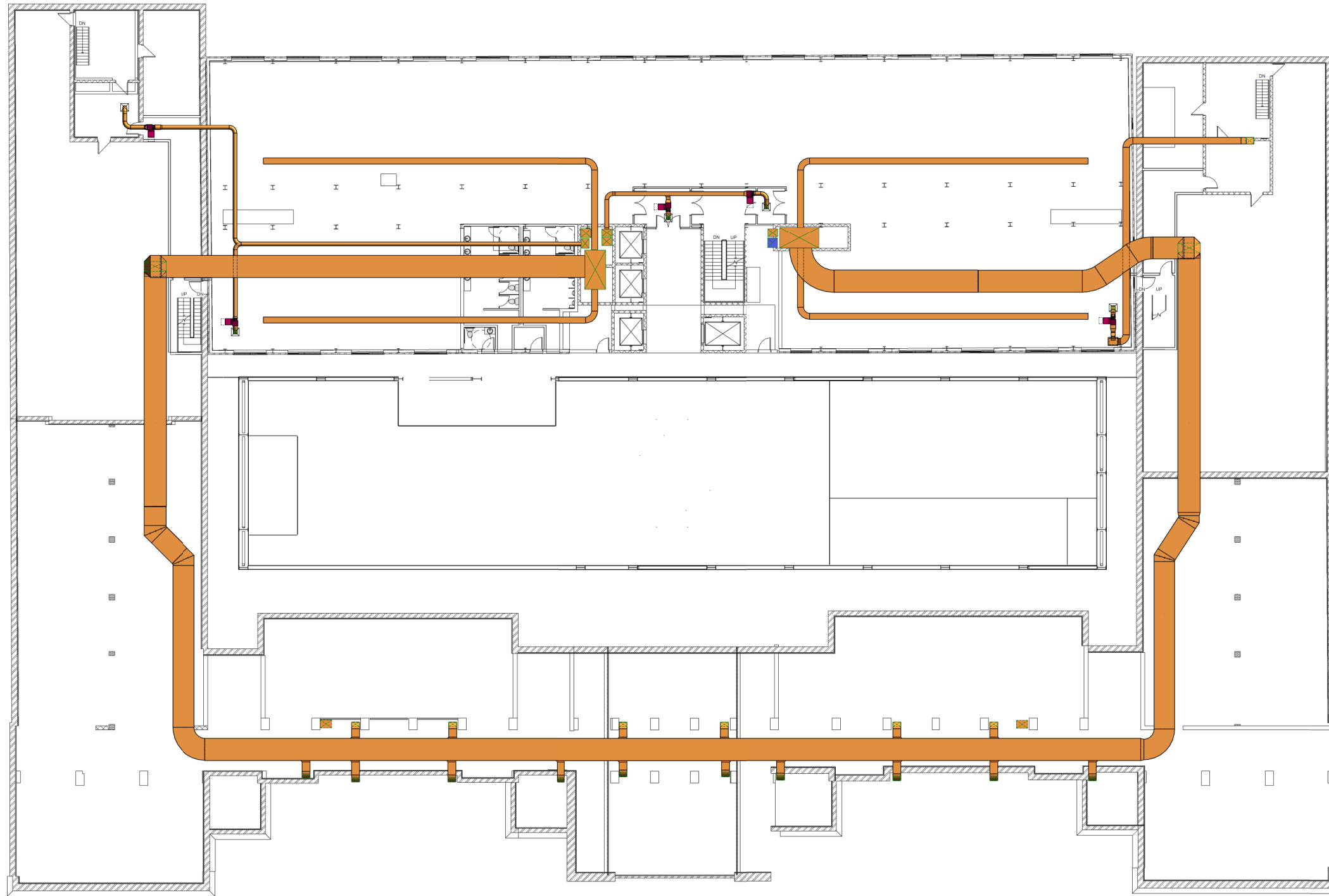
8. Level 3 – Ventilation Distribution



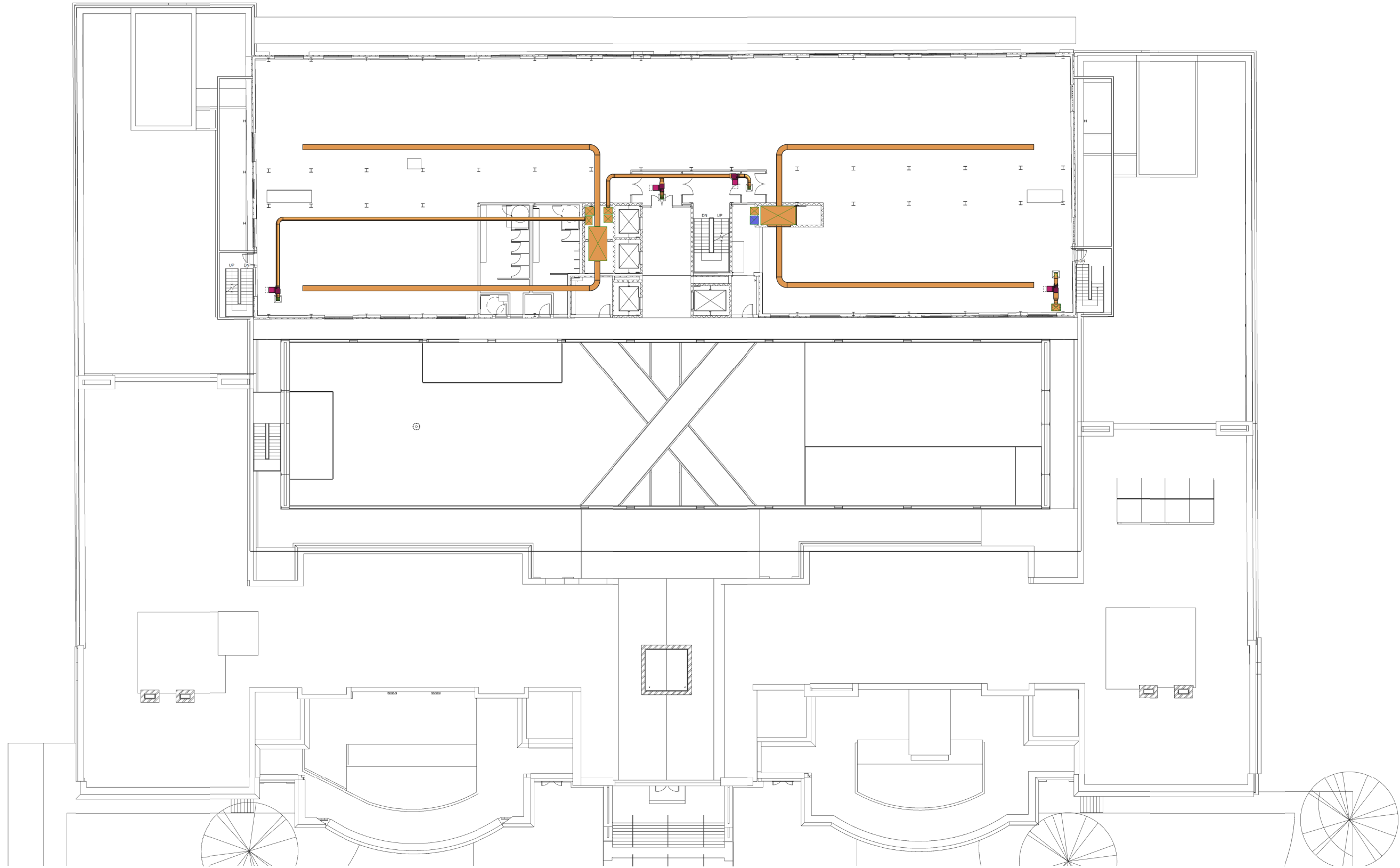
9. Level 4 – Ventilation Distribution



M1. Mechanical Drawings



10. Level 5 – Ventilation Distribution



11. Level 6 – Ventilation Distribution



M1. Mechanical Drawings

System Type	U of A Equipment Tag	Description	Location	Capacity	Electrical	Emergency Power	Comments
Heating System							
High Pressure Steam Reducing Station	DPC-HPS1-PV1	pilot operated PRV	Basement				
High Pressure Steam Reducing Station	DPC-HPS1-PV2	pilot operated PRV	Basement				
High Pressure Steam Reducing Station	DPC-HPS1-PV3	Automatic PRV	Basement			YES	
High Pressure Steam Reducing Station	DPC-HPS1-PV4	Automatic PRV	Basement			YES	
High Pressure Steam Reducing Station	DPC-PCOND1-TK1	Primary Condensate Receiver	Basement				
High Pressure Steam Reducing Station	DPC-PCOND1-TK2	HPS drip condensate cooler	Basement				
High Pressure Steam Reducing Station	DPC-PCOND1-P1	Primary Condensate Pump	Basement	100%	15 HP	YES	
High Pressure Steam Reducing Station	DPC-PCOND1-P2	Primary Condensate Pump	Basement	100%	15 HP	YES	
Hot Glycol heating Sytem	DPC-HGLY1-HX1	Steam to hot glycol heat exchanger	Penthouse				
Hot Glycol heating Sytem	DPC-HGLY1-HX2	Steam to hot glycol heat exchanger	Penthouse				
Hot Glycol heating Sytem	DPC-HGLY1-TK1	Glycol recovery tank	Penthouse				
Hot Glycol heating Sytem	DPC-HGLY1-TK2	Air separator	Penthouse				
Hot Glycol heating Sytem	DPC-HGLY1-TK3	Bladder Expansion Tank	Penthouse				
Hot Glycol heating Sytem	DPC-HGLY1-TK4	Glycol Fill tank	Penthouse				
Hot Glycol heating Sytem	DPC-HGLY1-TK5	Chemical Pot Feeder	Penthouse				
Hot Glycol heating Sytem	DPC-HGLY1-P1	Glycol Circulation Pump	Penthouse	100%	3 HP	YES	
Hot Glycol heating Sytem	DPC-HGLY1-VFD1	Glycol Circulation Pump P-1 VFD					
Hot Glycol heating Sytem	DPC-HGLY1-P2	Glycol Circulation Pump	Penthouse	100%	3 HP	YES Standby	
Hot Glycol heating Sytem	DPC-HGLY1-VFD2	Glycol Circulation Pump P-2 VFD					
Hot Glycol heating Sytem	DPC-HGLY1-P3	AHU-3 Glycol Circulation Pump	Penthouse	100%	1 HP 1200 RPM	YES Standby	
Hot Glycol heating Sytem	DPC-HGLY1-P4	AHU-1 Preheat coil pump	Penthouse	100%	1 HP 1200 RPM	YES	
Hot Glycol heating Sytem	DPC-HGLY1-VFD3	AHU-1 Preheat coil pump P-4 VFD					
Hot Glycol heating Sytem	DPC-HGLY1-P5	AHU-2 Preheat coil pump	Penthouse	100%	1 HP 1200 RPM	YES	
Hot Glycol heating Sytem	DPC-HGLY1-VFD4	AHU-2 Preheat coil pump P-5 VFD					
Hot Glycol heating Sytem	DPC-PCOND2-P1	Hot glycol system condensate pump	Penthouse	100%	7.5 HP	YES	
Hot Glycol heating Sytem	DPC-PCOND2-P2	Hot glycol system condensate pump	Penthouse	100%	7.5 HP	YES Standby	
Hot Glycol heating Sytem	DPC-AHU1-PHC1	AHU-1 Preheat coil	Penthouse	257 GPM 13.94 ft PD 180-140F			
Hot Glycol heating Sytem	DPC-AHU1-PHC2	AHU-1 Preheat coil	Penthouse	split coil see above			
Hot Glycol heating Sytem	DPC-AHU1-PHC3	AHU-1 Preheat coil	Penthouse	257 GPM 13.94 ft PD 180-140F			
Hot Glycol heating Sytem	DPC-AHU1-PHC4	AHU-1 Preheat coil	Penthouse	split coil see above			
Hot Glycol heating Sytem	DPC-AHU2-PHC1	AHU-2 Preheat coil	Penthouse	257 GPM 13.94 ft PD 180-140F			
Hot Glycol heating Sytem	DPC-AHU2-PHC2	AHU-2 Preheat coil	Penthouse	split coil see above			
Hot Glycol heating Sytem	DPC-AHU2-PHC3	AHU-2 Preheat coil	Penthouse	257 GPM 13.94 ft PD 180-140F			
Hot Glycol heating Sytem	DPC-AHU2-PHC4	AHU-2 Preheat coil	Penthouse	split coil see above			
Hot Glycol heating Sytem	DPC-AHU3-HC1	AHU-3 heating coil	Penthouse				
Hot Glycol heating Sytem	DPC-AHU3-HC2	AHU-3 heating coil	Penthouse				
Hot Glycol heating Sytem	DPC-AHU4-HC1	AHU-4 heating coil	Penthouse				

System Type	U of A Equipment Tag	Description	Location	Capacity	Electrical	Emergency Power	Comments
Hot Glycol heating Sytem	DPC-AHU4-HC2	AHU-4 heating coil	Penthouse				
Hot Glycol heating Sytem	DPC-AHU5-HC1	AHU-5 heating coil	Penthouse				
Hot Glycol heating Sytem	DPC-AHU5-HC2	AHU-5 heating coil	Penthouse				
Hot Glycol heating Sytem	DPC-AHU6-HC1	AHU-6 heating coil	Penthouse				
Hot Glycol heating Sytem	DPC-AHU6-HC2	AHU-6 heating coil	Penthouse				
Hot Glycol heating Sytem	DPC-AHU7-HC1	AHU-7 heating coil	Penthouse				
Hot Glycol heating Sytem	DPC-AHU7-HC2	AHU-7 heating coil	Penthouse				
Hot Glycol heating Sytem	DPC-AHU8-HC1	AHU-8 heating coil	Penthouse				
Hot Glycol heating Sytem	DPC-AHU8-HC2	AHU-8 heating coil	Penthouse				
Domestic Cold Water		Domestic Cold Water Booster Pump	Basement	100%	15 HP 575/23	YES	
Domestic Cold Water		Domestic Cold Water Booster Pump	Basement	100%	15 HP 575/23	YES Standby	
Domestic Cold Water		VFD DCW Booster Pump	Basement	100%		YES	
Domestic Cold Water		VFD DCW Booster Pump	Basement	100%		YES Standby	
Domestic Cold Water		Back Flow Preventer	Basement				
Domestic Cold Water		Back Flow Preventer	Basement				
Fire Protection		Fire Pump	Basement	100%	50HP	YES	
Fire Protection		Fire Pump	Basement	100%	50HP	YES Standby	
DCW Preheat from Condensate	P-PC-3	DCW Pre-Heat Condensate Pump					
Domestic Hot Water	DPC-DHW1-P1	Domestic hot water pump	Basement	1	10 HP	YES	
Domestic Hot Water	DPC-DHW1-P2	Domestic hot water pump	Basement	1	10 HP	YES Standby	
Domestic Hot Water	DPC-DHW1-P2	Domestic hot water re-circulation pump	Basement				
Domestic Hot Water	DPC-DHW1-TK1	Domestic Hot Water Storage Tank	Basement				
Domestic Hot Water	DPC-DHW1-TK2	Domestic Hot Water Storage Tank	Basement				
Domestic Hot Water	DPC-DHW1-HX1	Domestic Hot Water Heat Exchanger	Basement				
Domestic Hot Water	DPC-DHW1-HX2	Domestic Hot Water Heat Exchanger	Basement				
Domestic water System		Hands Free Faucets	distributed through out		115/1	Yes	
Domestic water System		Bottle Fill stations	distributed through out		15 amp 115V/60 Hz 3 prong plug		
Steam Humidification	DPC-PCOND3-TK1	Steam Humidification Condensate receiver AHU-1					
Steam Humidification	DPC-PCOND3-P1	Primary condensate pump AHU-1 humidification			0.5 HP		
Steam Humidification	DPC-PCOND3-P2	Primary condensate pump AHU-1 humidification			0.5 HP		
Steam Humidification	DPC-PCOND4-TK1	Steam Humidification Condensate receiver AHU-2					
Steam Humidification	DPC-PCOND4-P1	Primary condensate pump AHU-2 humidification			0.5 HP		
Steam Humidification	DPC-PCOND4-P2	Primary condensate pump AHU-2 humidification			0.5 HP		
Primary Heating System	DPC-HW1-HX1	Steam to water heat exchanger					
Primary Heating System	DPC-HW1-HX2	Steam to water heat exchanger					
Primary Heating System	DPC-PCOND5-TK1	Primary Condensate Receiver					
Primary Heating System	DPC-PCOND5-P1	Condensate Pump			0.5 HP		
Primary Heating System	DPC-PCOND5-P2	Condensate Pump			0.5 HP		

M2. Preliminary Mechanical Equip. List

System Type	U of A Equipment Tag	Description	Location	Capacity	Electrical	Emergency Power	Comments
Primary Heating System	DPC-HW1-TK1	Air separator					
Primary Heating System	DPC-HW1-TK2	Bladder Expansion Tank					
Primary Heating System	DPC-HW1-TK3	Glycol Fill tank					
Primary Heating System	DPC-HW1-P1	Hot Water Primary Circulation Pump	Penthouse	500 gpm 80 ft hd	15 HP	YES	
Primary Heating System	DPC-HW1-P2	Hot Water Primary Circulation Pump	Penthouse	500 gpm 80 ft hd	15 HP	YES Standby	
Primary Heating System	DPC-HW1-VFD1	VFD for Hot Water Primary Circulation Pump HW2-P1	Penthouse	100%		YES	
Primary Heating System	DPC-HW1-VFD2	VFD for Hot Water Primary Circulation Pump HW2-P2	Penthouse	100%		YES Standby	
Primary Heating System	DPC-HW2-P1	Hot Water AHU-1 Heating Coil Circulation Pump	Penthouse	130 GPM 6 ft pf	0.5 HP	YES	
Primary Heating System	DPC-HW2-P2	Hot Water AHU-2 Heating Coil Circulation Pump	Penthouse	130 GPM 6 ft pf	0.5 HP	YES	
Primary Heating System	DPC-HW2-VFD1	VFD for Hot Water AHU-1 Heating Coil Circulation Pump HW3-P1	Penthouse	100%		YES	
Primary Heating System	DPC-HW2-VFD2	VFD for Hot Water AHU-2 Heating Coil Circulation Pump HW3-P2	Penthouse	100%		YES	
Primary Heating System	DPC-AHU1-HC1	AHU-1 Heating coil	Penthouse				
Primary Heating System	DPC-AHU1-HC2	AHU-1 Heating coil	Penthouse				
Primary Heating System	DPC-AHU1-HC3	AHU-1 Heating coil	Penthouse				
Primary Heating System	DPC-AHU1-HC4	AHU-1 Heating coil	Penthouse				
Primary Heating System	DPC-AHU2-HC1	AHU-2 Heating coil	Penthouse				
Primary Heating System	DPC-AHU2-HC2	AHU-2 Heating coil	Penthouse				
Primary Heating System	DPC-AHU2-HC3	AHU-2 Heating coil	Penthouse				
Primary Heating System	DPC-AHU2-HC4	AHU-2 Heating coil	Penthouse				
Change Over Heating System	DPC-HW3-HX1	Steam to water heat exchanger					
Change Over Heating System	DPC-HW3-HX2	Steam to water heat exchanger					
Change Over Heating System	DPC-PCOND5-TK1	Primary Condensate Receiver					
Change Over Heating System	DPC-PCOND5-P1	Condensate Pump			0.5 HP		
Change Over Heating System	DPC-PCOND5-P2	Condensate Pump			0.5 HP		
Change Over Heating System	DPC-HW3-TK1	Air separator					
Change Over Heating System	DPC-HW3-TK2	Bladder Expansion Tank					
Change Over Heating System	DPC-HW3-TK3	Chemical Pot Feeder					
Change Over Heating System	DPC-HW3-P1	Hot Water Primary Circulation Pump			10 HP		
Change Over Heating System	DPC-HW3-P2	Hot Water Primary Circulation Pump			10 HP		
Change Over Heating System	DPC-HW3-VFD1	VFD for Hot Water Primary Circulation Pump HW3-P1					
Change Over Heating System	DPC-HW3-VFD2	VFD for Hot Water Primary Circulation Pump HW3-P2					
Cooling System							
Chilled Water System (CW)							
Chilled Water System (CW)	DPC-CHW1-P1	Main Primary CW Pump		1400 gpm 40 ft h20	15 HP		
Chilled Water System (CW)	DPC-CHW1-P2	Main Primary CW Pump		1400 gpm 40 ft h20	15 HP		
Chilled Water System (CW)	DPC-CHW1-P3	Main Primary CW Pump		1400 gpm 40 ft h20	15 HP		
Chilled Water System (CW)	DPC-CHW1-VFD1	VFD for CHW1-P1					
Chilled Water System (CW)	DPC-CHW1-VFD2	VFD for CHW1-P2					
Chilled Water System (CW)	DPC-CHW1-VFD3	VFD for CHW1-P3					

System Type	U of A Equipment Tag	Description	Location	Capacity	Electrical	Emergency Power	Comments
Chilled Water System (CW)	DPC-CHW1-SEP1	CW Centrifugal Separator					
Chilled Water System (CW)	DPC-CHW1-SEP2	CW Centrifugal Separator					
Chilled Water System (CW)	DPC-CHW1-SEP3	CW Centrifugal Separator					
Chilled Water System (CW)	DPC-CHW2-P1	Change Over CW Pump					
Chilled Water System (CW)	DPC-CHW2-P2	Change Over CW Pump					
Chilled Water System (CW)	DPC-CHW2-VFD1	VFD for CHW2-P1					
Chilled Water System (CW)	DPC-CHW2-VFD2	VFD for CHW2-P2					
Chilled Water System (CW)	DPC-AHU1-PHCC1	Clg Coil & plug load winter reclaim coil					
Chilled Water System (CW)	DPC-AHU1-PHCC2	Clg Coil & plug load winter reclaim coil					
Chilled Water System (CW)	DPC-AHU1-PHCC3	Clg Coil & plug load winter reclaim coil					
Chilled Water System (CW)	DPC-AHU1-PHCC4	Clg Coil & plug load winter reclaim coil					
Chilled Water System (CW)	DPC-AHU2-PHCC1	Clg Coil & plug load winter reclaim coil					
Chilled Water System (CW)	DPC-AHU2-PHCC2	Clg Coil & plug load winter reclaim coil					
Chilled Water System (CW)	DPC-AHU2-PHCC3	Clg Coil & plug load winter reclaim coil					
Chilled Water System (CW)	DPC-AHU2-PHCC4	Clg Coil & plug load winter reclaim coil					
Chilled Water System (CW)	DPC-AHU3-CC1	Cooling Coil					
Chilled Water System (CW)	DPC-AHU3-CC2	Cooling Coil					
Chilled Water System (CW)	DPC-CHW3-P1	All Year CW Pump					
Chilled Water System (CW)	DPC-CHW3-P2	All Year CW Pump					
Chilled Water System (CW)	DPC-CHW1-VFD1	VFD for CHW3-P1					
Chilled Water System (CW)	DPC-CHW1-VFD2	VFD for CHW3-P2					
Chilled Water System (CW)	DPC-CHW4-HX1	All Year CW Heat Exchanger					
Chilled Water System (CW)	DPC-CHW4-HX2	All Year CW Heat Exchanger					
Chilled Water System (CW)	DPC-CHW4-TK1	All Year CW Expansion tank					
Chilled Water System (CW)	DPC-CHW4-TK2	All Year CW Air Separator					
Chilled Water System (CW)	DPC-CHW4-TK3	All Year CW Chemical Pot Feeder					
Chilled Water System (CW)	DPC-CHW4-P1	All Year CW Distribution Pump			7.5 HP		
Chilled Water System (CW)	DPC-CHW4-P2	All Year CW Distribution Pump			7.5 HP		
Chilled Water System (CW)	DPC-CHW4-VFD1	VFD for All Year CW Distribution Pump					
Chilled Water System (CW)	DPC-CHW4-VFD2	VFD for All Year CW Distribution Pump					
Ventilation System							
Fan Coil Cooling System	DPC-CHW4-FC1	Fan Coil For Sub Electrical Room Cooling	6th floor	Total Clg 6.94 kW Air Flow 920 L/s	motor 0.6 kW, RPM 727-1029		
Fan Coil Cooling System	DPC-CHW4-FC2	Fan Coil For Sub Electrical Room Cooling	5th floor	Total Clg 6.94 kW Air Flow 920 L/s	motor 0.6 kW, RPM 727-1029		
Fan Coil Cooling System	DPC-CHW4-FC3	Fan Coil For Sub Electrical Room Cooling	4th floor	Total Clg 6.94 kW Air Flow 920 L/s	motor 0.6 kW, RPM 727-1029		
Fan Coil Cooling System	DPC-CHW4-FC4	Fan Coil For Sub Electrical Room Cooling	4th floor	Total Clg 6.94 kW Air Flow 920 L/s	motor 0.6 kW, RPM 727-1029		
Fan Coil Cooling System	DPC-CHW4-FC5	Fan Coil For Sub Electrical Room Cooling	4th floor	Total Clg 6.94 kW Air Flow 920 L/s	motor 0.6 kW, RPM 727-1029		
Fan Coil Cooling System	DPC-CHW4-FC6	Fan Coil For Sub Electrical Room Cooling	3rd floor	Total Clg 6.94 kW Air Flow 920 L/s	motor 0.6 kW, RPM 727-1029		
Fan Coil Cooling System	DPC-CHW4-FC7	Fan Coil For Sub Electrical Room Cooling	3rd floor	Total Clg 6.94 kW Air Flow 920 L/s	motor 0.6 kW, RPM 727-1029		
Fan Coil Cooling System	DPC-CHW4-FC8	Fan Coil For Sub Electrical Room Cooling	3rd floor	Total Clg 6.94 kW Air Flow 920 L/s	motor 0.6 kW, RPM 727-1029		

M2. Preliminary Mechanical Equip. List

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System Type	U of A Equipment Tag	Description	Location	Capacity	Electrical	Emergency Power	Comments
Fan Coil Cooling System	DPC-CHW4-FC9	Fan Coil For Sub Electrical Room Cooling	2nd floor	Total Clg 6.94 kW Air Flow 920 L/s	motor 0.6 kW, RPM 727-1029		
Fan Coil Cooling System	DPC-CHW4-FC10	Fan Coil For Sub Electrical Room Cooling	2nd floor	Total Clg 6.94 kW Air Flow 920 L/s	motor 0.6 kW, RPM 727-1029		
Fan Coil Cooling System	DPC-CHW4-FC11	Fan Coil For Sub Electrical Room Cooling	2nd floor	Total Clg 6.94 kW Air Flow 920 L/s	motor 0.6 kW, RPM 727-1029		
Fan Coil Cooling System	DPC-CHW4-FC12	Fan Coil For Sub Electrical Room Cooling	1st floor	Total Clg 6.94 kW Air Flow 920 L/s	motor 0.6 kW, RPM 727-1029		
Fan Coil Cooling System	DPC-CHW4-FC13	Fan Coil For Sub Electrical Room Cooling	1st floor	Total Clg 6.94 kW Air Flow 920 L/s	motor 0.6 kW, RPM 727-1029		
Fan Coil Cooling System	DPC-CHW4-FC14	Fan Coil For Sub Electrical Room Cooling	1st floor	Total Clg 6.94 kW Air Flow 920 L/s	motor 0.6 kW, RPM 727-1029		
Fan Coil Cooling System	DPC-CHW4-FC1	Fan Coil For Sub Communication Room Cooling	6th floor	Total Clg 7.29 kW Air Flow 990 L/s	motor 0.746 kW, RPM 727-1029		
Fan Coil Cooling System	DPC-CHW4-FC2	Fan Coil For Sub Communication Room Cooling	5th floor	Total Clg 7.29 kW Air Flow 990 L/s	motor 0.746 kW, RPM 727-1029		
Fan Coil Cooling System	DPC-CHW4-FC3	Fan Coil For Sub Communication Room Cooling	4th floor	Total Clg 7.29 kW Air Flow 990 L/s	motor 0.746 kW, RPM 727-1029		
Fan Coil Cooling System	DPC-CHW4-FC4	Fan Coil For Sub Communication Room Cooling	4th floor	Total Clg 7.29 kW Air Flow 990 L/s	motor 0.746 kW, RPM 727-1029		
Fan Coil Cooling System	DPC-CHW4-FC5	Fan Coil For Sub Communication Room Cooling	4th floor	Total Clg 7.29 kW Air Flow 990 L/s	motor 0.746 kW, RPM 727-1029		
Fan Coil Cooling System	DPC-CHW4-FC6	Fan Coil For Sub Communication Room Cooling	3rd floor	Total Clg 7.29 kW Air Flow 990 L/s	motor 0.746 kW, RPM 727-1029		
Fan Coil Cooling System	DPC-CHW4-FC7	Fan Coil For Sub Communication Room Cooling	3rd floor	Total Clg 7.29 kW Air Flow 990 L/s	motor 0.746 kW, RPM 727-1029		
Fan Coil Cooling System	DPC-CHW4-FC8	Fan Coil For Sub Communication Room Cooling	3rd floor	Total Clg 7.29 kW Air Flow 990 L/s	motor 0.746 kW, RPM 727-1029		
Fan Coil Cooling System	DPC-CHW4-FC9	Fan Coil For Sub Communication Room Cooling	2nd floor	Total Clg 7.29 kW Air Flow 990 L/s	motor 0.746 kW, RPM 727-1029		
Fan Coil Cooling System	DPC-CHW4-FC10	Fan Coil For Sub Communication Room Cooling	2nd floor	Total Clg 7.29 kW Air Flow 990 L/s	motor 0.746 kW, RPM 727-1029		
Fan Coil Cooling System	DPC-CHW4-FC11	Fan Coil For Sub Communication Room Cooling	2nd floor	Total Clg 7.29 kW Air Flow 990 L/s	motor 0.746 kW, RPM 727-1029		
Fan Coil Cooling System	DPC-CHW4-FC12	Fan Coil For Sub Communication Room Cooling	1st floor	Total Clg 7.29 kW Air Flow 990 L/s	motor 0.746 kW, RPM 727-1029		
Fan Coil Cooling System	DPC-CHW4-FC13	Fan Coil For Sub Communication Room Cooling	1st floor	Total Clg 7.29 kW Air Flow 990 L/s	motor 0.746 kW, RPM 727-1029		
Fan Coil Cooling System	DPC-CHW4-FC14	Fan Coil For Sub Communication Room Cooling	1st floor	Total Clg 7.29 kW Air Flow 990 L/s	motor 0.746 kW, RPM 727-1029		
Dedicated Air Conditioning System		Main Electrical Room	Basement	Total Clg 60 kW		Yes	
Dedicated Air Conditioning System		Main Communication Room	Basement	Total Clg 20 kW		Yes	
Ventilation System Main Building	DPC-AHU1-SF1	AHU-1 Supply Fan	Penthouse	22 plug fans	7.5 HP each fan 165 HP total 575V/3	Yes	
Ventilation System Main Building	DPC-AHU1-VFD1	VFD for All Year Supply Fan	Penthouse			Yes	
Ventilation System Main Building	DPC-AHU1-RF1	AHU-1 Return Fan	Penthouse	18 plug fans	7 HP each fan 90 HP total 575V/3	Yes	
Ventilation System Main Building	DPC-AHU1-VFD2	VFD for All Year Return Fan	Penthouse			Yes	

M2 Preliminary Mechanical Equipment List

System Type	U of A Equipment Tag	Description	Location	Capacity	Electrical	Emergency Power	Comments
Vestibule Fire Pressurization	DPC-AHU6-TBS6	Air Terminal Box	L-1 Vestibule ceiling	500 L/s		Yes	
Vestibule Fire Pressurization	DPC-AHU7-TBS1	Air Terminal Box	L-7 Vestibule ceiling	500 L/s		Yes	
Vestibule Fire Pressurization	DPC-AHU7-TBS2	Air Terminal Box	L-5 Vestibule ceiling	500 L/s		Yes	
Vestibule Fire Pressurization	DPC-AHU7-TBS3	Air Terminal Box	L-4 Vestibule ceiling	500 L/s		Yes	
Vestibule Fire Pressurization	DPC-AHU7-TBS7	Air Terminal Box	L-3 Vestibule ceiling	500 L/s		Yes	
Vestibule Fire Pressurization	DPC-AHU7-TBS5	Air Terminal Box	L-2 Vestibule ceiling	500 L/s		Yes	
Vestibule Fire Pressurization	DPC-AHU7-TBS7	Air Terminal Box	L-1 Vestibule ceiling	500 L/s		Yes	
Vestibule Fire Pressurization	DPC-AHU8-TBS1	Air Terminal Box	L-8 Vestibule ceiling	500 L/s		Yes	
Vestibule Fire Pressurization	DPC-AHU8-TBS2	Air Terminal Box	L-5 Vestibule ceiling	500 L/s		Yes	
Vestibule Fire Pressurization	DPC-AHU8-TBS3	Air Terminal Box	L-4 Vestibule ceiling	500 L/s		Yes	
Vestibule Fire Pressurization	DPC-AHU8-TBS8	Air Terminal Box	L-3 Vestibule ceiling	500 L/s		Yes	
Vestibule Fire Pressurization	DPC-AHU8-TBS5	Air Terminal Box	L-2 Vestibule ceiling	500 L/s		Yes	
Vestibule Fire Pressurization	DPC-AHU8-TBS8	Air Terminal Box	L-1 Vestibule ceiling	500 L/s		Yes	
Exhaust System	DPC-	Washroom Exhaust Fan	penthouse	4500 L/s			

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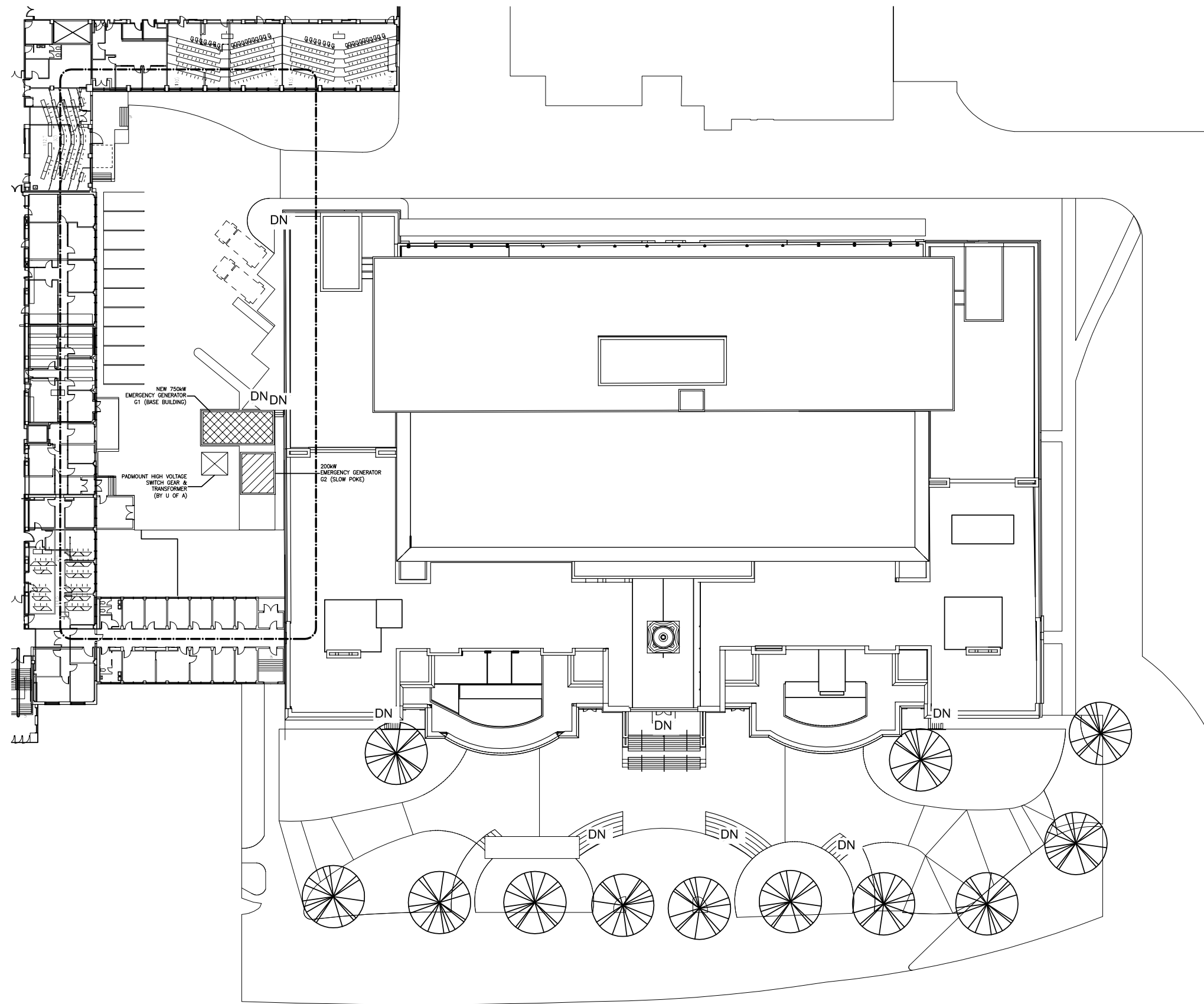
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22 05 48	Vibration Controls for Plumbing Piping and Equipment.....	1
22 05 53	Painting and Identification for Plumbing.....	1
22 07 16	Plumbing Equipment Insulation	1
22 07 19	Plumbing Piping Insulation.....	1
22 09 00	Instrumentation and Control for Plumbing	1
22 11 16	Domestic Water Piping	1
22 11 19	Domestic Water Piping Specialties.....	7
22 11 21	Domestic Water Piping System Cleaning and Disinfecting	1
22 11 23	Domestic Water Pumps.....	1
22 13 16	Sanitary Waste and Vent Piping	1
22 13 19	Sanitary Waste Piping Specialties	6
22 14 13	Facility Storm Drainage Piping.....	1
22 14 23	Storm Drainage Piping Specialties	4
22 15 13	General Service – Compressed Air Piping	1
22 31 16	Commercial Domestic Water Softening Equipment	7
22 42 13	Commercial Water Closets, Urinals and Trim	8
22 42 16	Commercial Lavatories, Sinks and Trim.....	7
22 47 13	Drinking Fountains	3
22 61 01	Piping for Laboratory Facilities.....	4
DIVISION 23 HEATING, VENTILATING AND AIR-CONDITIONING (HVAC)		
23 05 01	General Provisions – Heating, Ventilating and Air Conditioning (HVAC).....	1
23 05 02	Equipment Supplied by Others	1
23 05 03	Electric Motors –Three Phase	1
23 05 04	Variable Frequency Drives for HVAC Equipment	1
23 05 05	Documentation for HVAC Systems.....	1
23 05 06	Demonstration and Owner's Instruction for HVAC Systems.....	1
23 05 07	Materials Testing – HVAC Systems.....	2
23 05 08	HVAC Equipment Testing and Startup	1
23 05 10	Counter flashing for Mechanical Equipment	2
23 05 16	Expansion Fittings and Loops for HVAC Piping.....	1
23 05 17	Tanks for HVAC Systems.....	1
23 05 19	Meters and Gauges for HVAC Systems	1
23 05 23	General Duty Valves and Strainers for HVAC Piping	1
23 05 29	Hangers and Supports, Anchors, Seals and Access Doors for HVAC Piping and Equipment.....	1
23 05 48	Vibration Controls for HVAC	1
23 05 53	Painting and Identification for HVAC Systems.....	1

<u>Section Number</u>	<u>Title</u>	<u>Pages</u>
23 05 92	Coordination with Balancing Agency.....	2
23 05 93	Testing, Adjusting and Balancing for HVAC Systems	1
23 07 13	Ductwork and Breeching Insulation	6
23 07 16	HVAC Equipment Insulation	4
23 07 19	HVAC Piping and Equipment Insulation	1
23 09 01	General Provisions for HVAC Controls	2
23 11 23	Facility Natural Gas Piping System.....	1
23 21 13	Hydronic Systems	2
23 21 14	In-Slab Heating System	3
23 21 30	Hydronic System Specialties	4
23 21 31	Hydronic System Specialties – Glycol.....	4
23 22 10	High Pressure Steam System.....	11
23 22 13	Low Pressure Steam and Condensate Heating Piping.....	2
23 22 23	Steam Condensate Pumps.....	3
23 22 25	Low Pressure Steam Specialties	4
23 25 13	System Cleaning and Chemical Treatment for Hydronic Systems	1
23 25 19	Steam System Cleaning and Chemical Treatment.....	1
23 31 13	Metal Ducts	11
23 31 14	Ductwork Cleaning.....	4
23 32 13	Fabricated Metal Air Plenums.....	3
23 33 13	Air Duct Accessories.....	8
23 33 19	Duct Silencers and Sound Traps	2
23 34 13	In-Line HVAC Fans	3
23 34 16	Centrifugal HVAC Fans.....	4
23 34 18	Fans – Exhaust Sets.....	5
23 36 15	Air Valves and Air Valve Controls	15
23 36 16	Single Duct Air Terminal Units.....	4
23 37 13	Air Outlets and Inlets.....	5
23 41 13	Panel Air Filters.....	3
23 41 23	Extended Surface Air Filters	3
23 51 10	Breeching and Chimneys.....	5
23 57 16	Shell and Tube Heat Exchangers	3
23 57 19	Plate Heat Exchangers	3
23 65 50	Centrifugal Water Filter.....	2
23 73 23	Custom Indoor Premanufactured Air Handling Units.....	24
23 81 23	Packaged Dedicated Air Conditioners (DAC)	9
23 82 13	Terminal Heat Transfer Units – Radiant Panels	5
23 82 16	Air Coils.....	4
23 82 19	Ceiling Mounted Horizontal Fan Coils.....	5
23 82 20	Water Source Packaged Heat Pumps.....	5
23 82 27	Modular Active Chilled Beams	7
23 82 36	Terminal Heat Transfer Units – Finned Tube Elements	3
23 82 39	Terminal Heat Transfer Units – Hydronic Unit Heaters/Entrance Heaters	3
23 84 14	Steam Grid Humidifier	3

M3. Mechanical Specification Outline



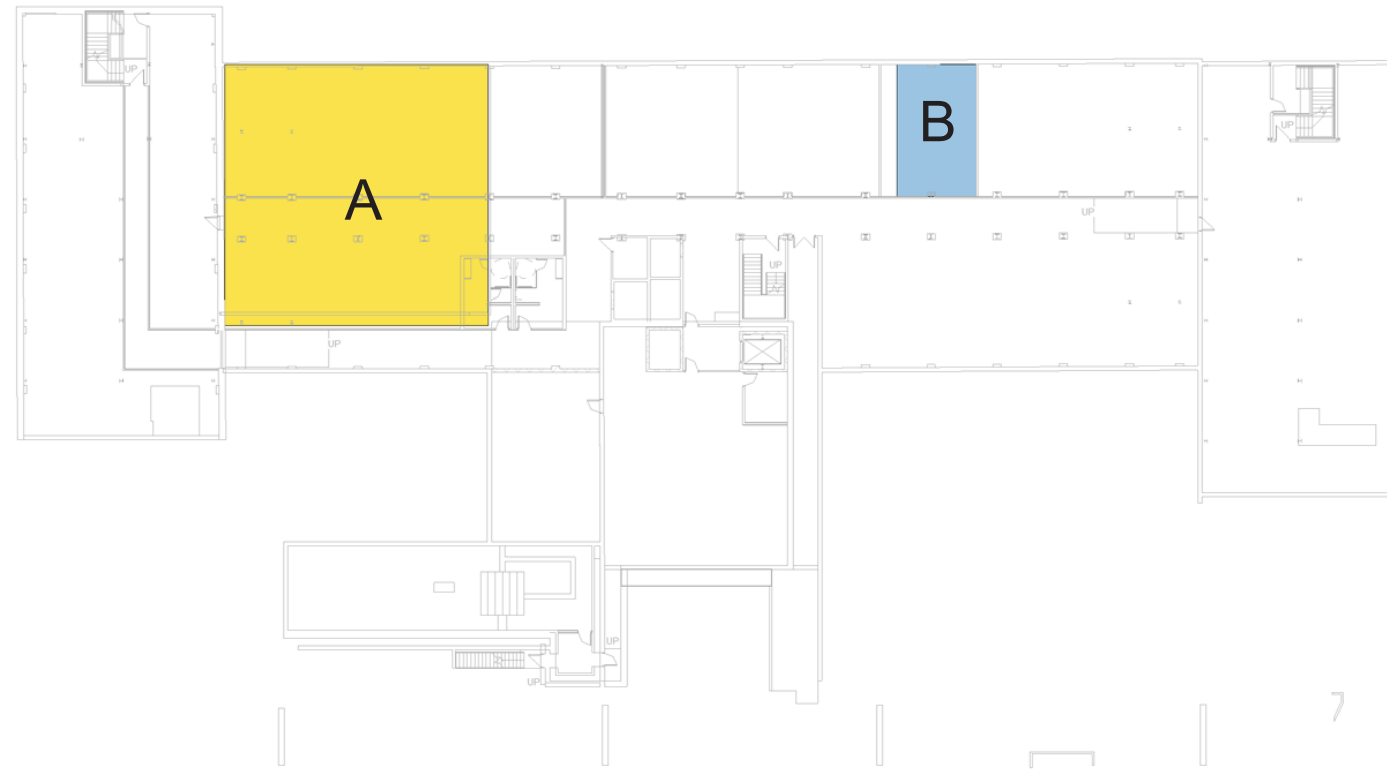
- *Electrical Drawings*
- *Preliminary Electrical Equip. List*
- *Electrical Specification Outline*



1. Electrical Site Plan Layout



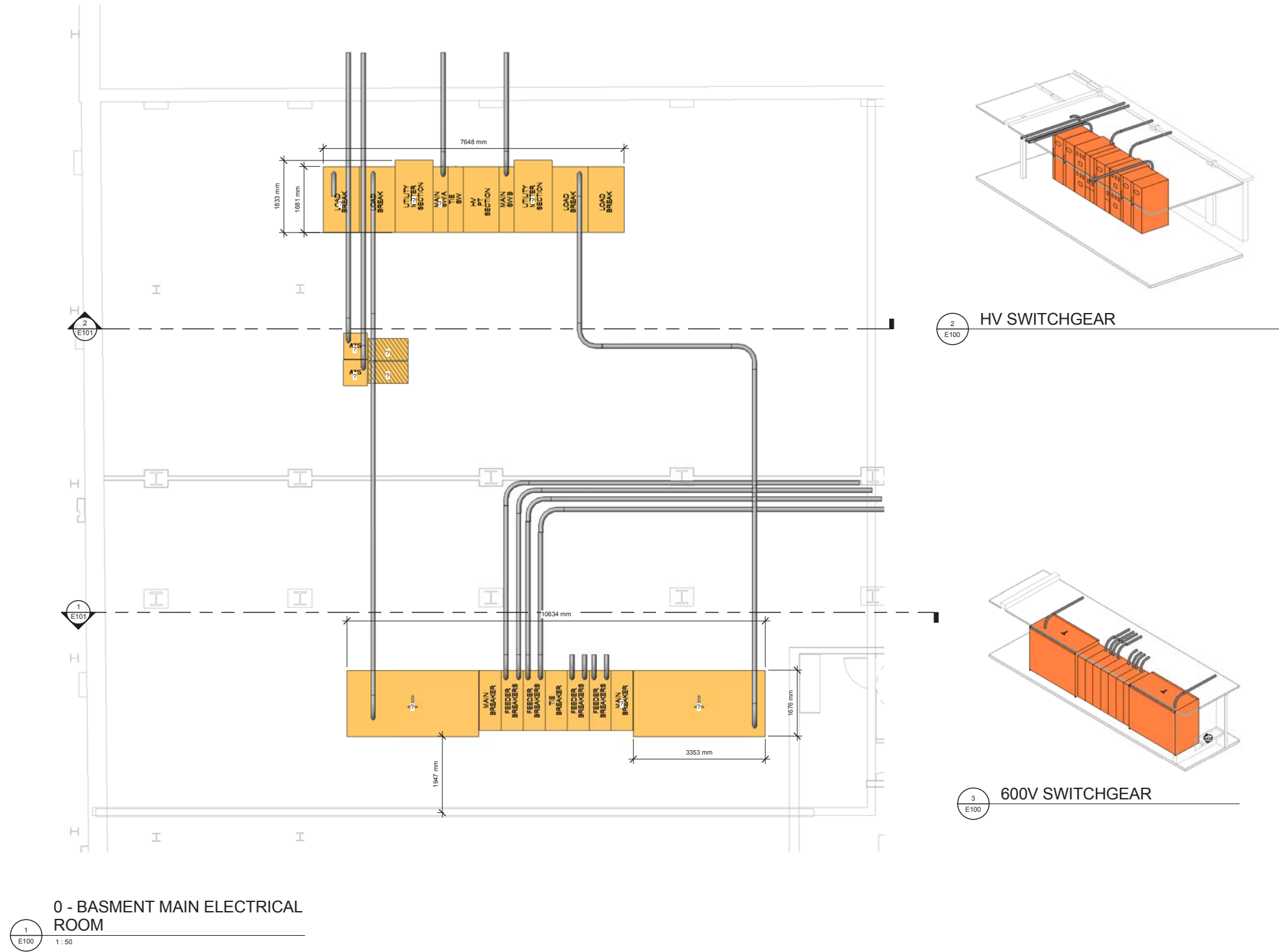
E.1 Electrical Drawings



LEGEND

SYMBOL	ELECTRICAL AREA	NOTES
A	MAIN ELECTRICAL SUBSTATION ROOM	
B	MAIN COMMUNICATION ROOM	

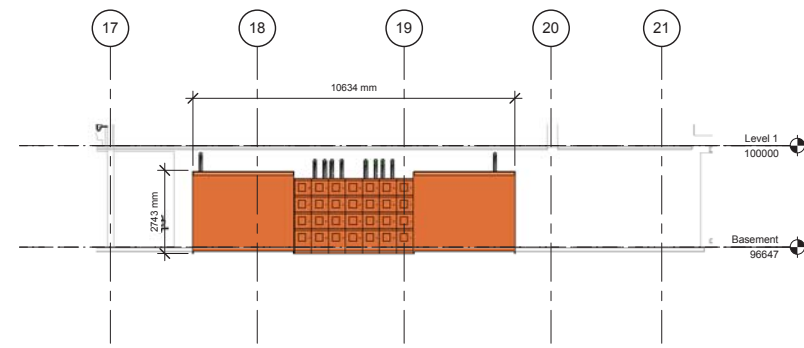
2. Basement Electrical Room Key Plan



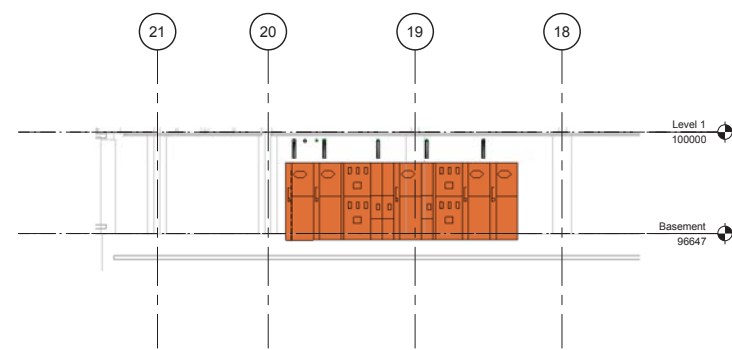
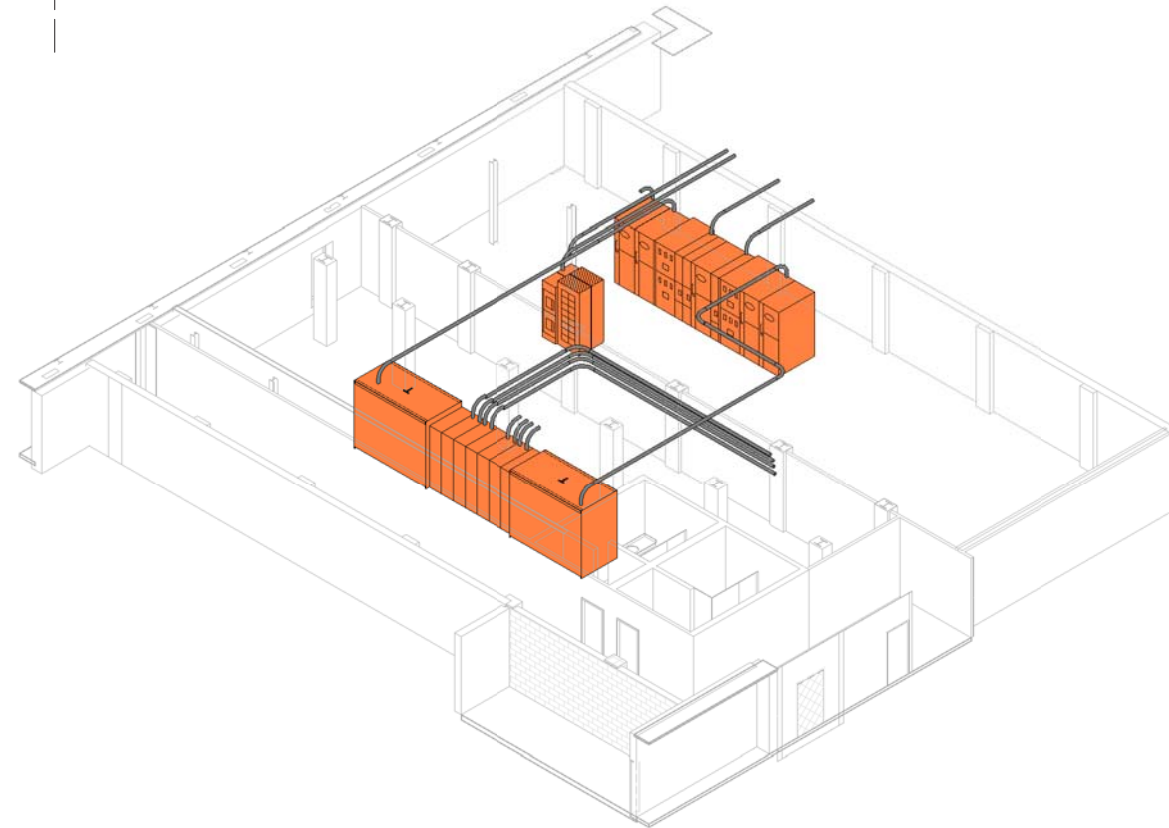
E.1 Electrical Drawings

3. Basement High Voltage Substation/Service Entrance Room





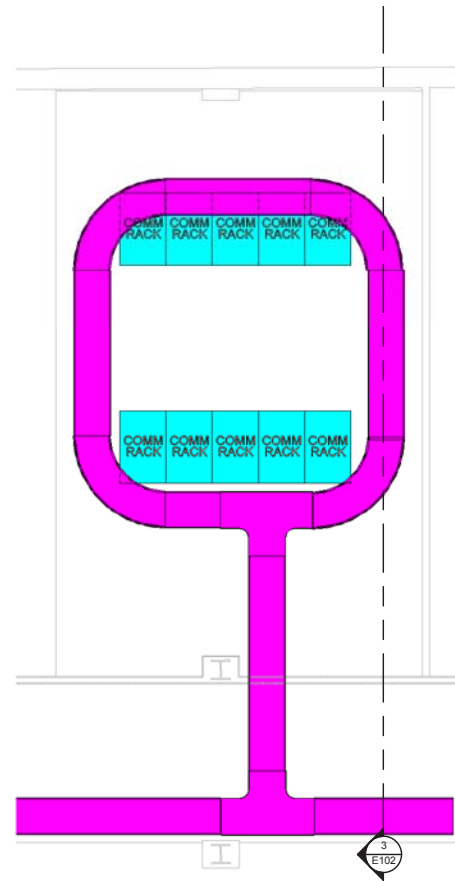
1
E101 1:100
600V ELEVATION (SOUTH)



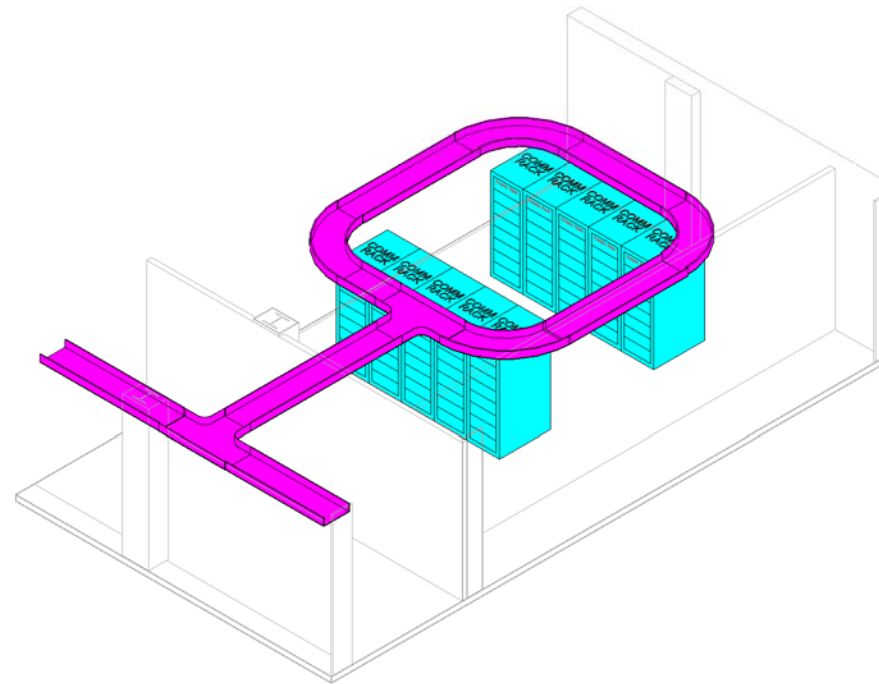
2
E101 1:100
HV SWITCHGEAR ELEVATION (NORTH)

3
E101
HV SUBSTATION ISO

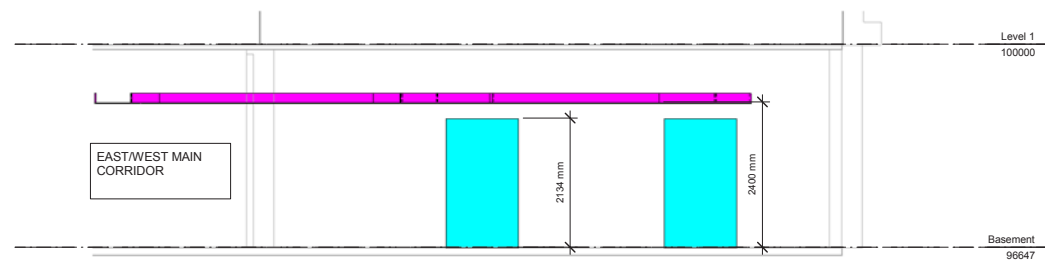
4. High Voltage Substation Details and Elevations



1
E102
0 - BASEMENT MAIN COMM ROOM
1:50



2
E102
BASEMENT MAIN COMMUNICATION ROOM ISO

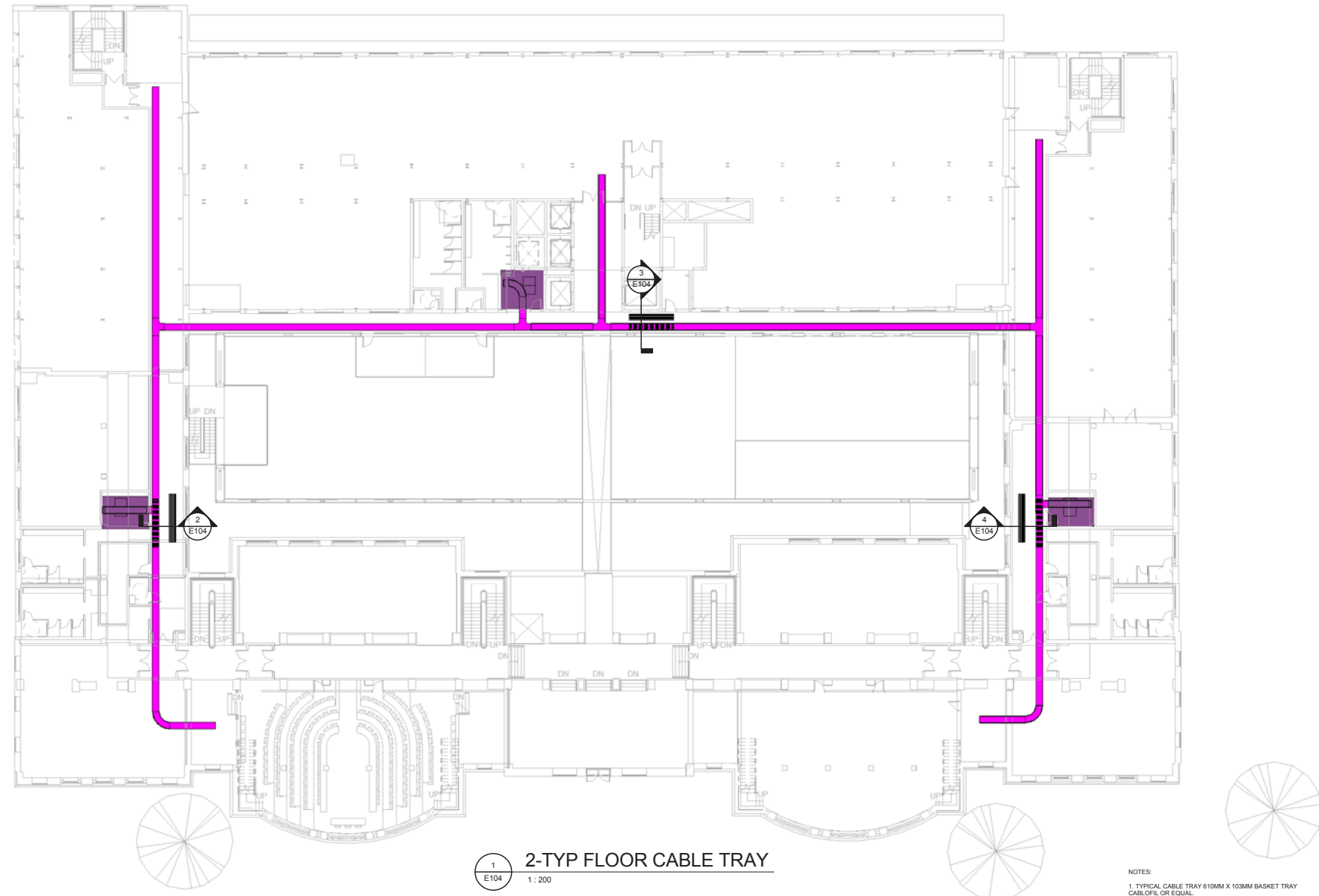


3
E102
BASEMENT MAIN COMM ROOM WEST SECTION
1:50

5. Basement Main Communication

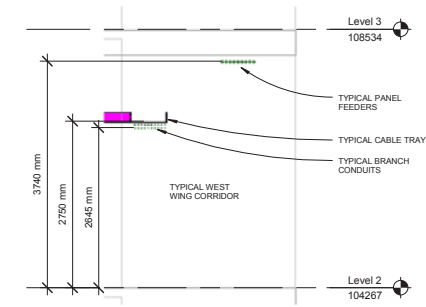


6. Typical Electrical and Communication Room Key Plans

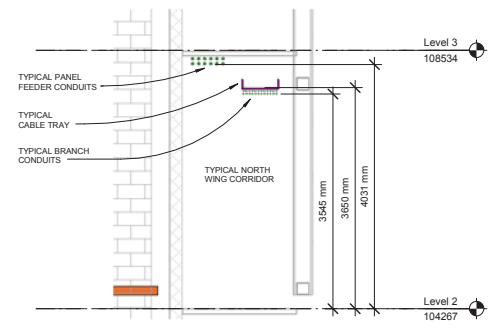


1 2-TYP FLOOR CABLE TRAY
E104 1:200

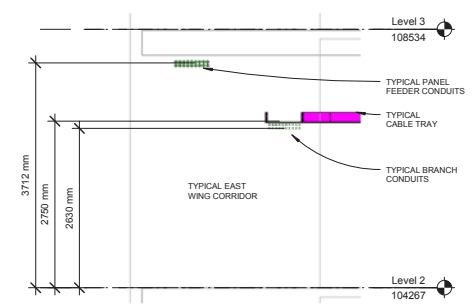
NOTES:
 1. TYPICAL CABLE TRAY 610MM X 103MM BASKET TRAY CABLE OR EQUAL.
 2. THE PURPOSE OF THIS DRAWING IS TO INDICATE PROPOSED TYPICAL CABLE TRAY ROUTING ON TYPICAL FLOORS. EXACT LOCATIONS AND ELEVATIONS SHALL BE COORDINATED ON EVERY FLOOR.



2 2- WEST WING CORRIDOR NORTH
E104 1:50



3 2- NORTH WING CORRIDOR EAST
E104 1:50



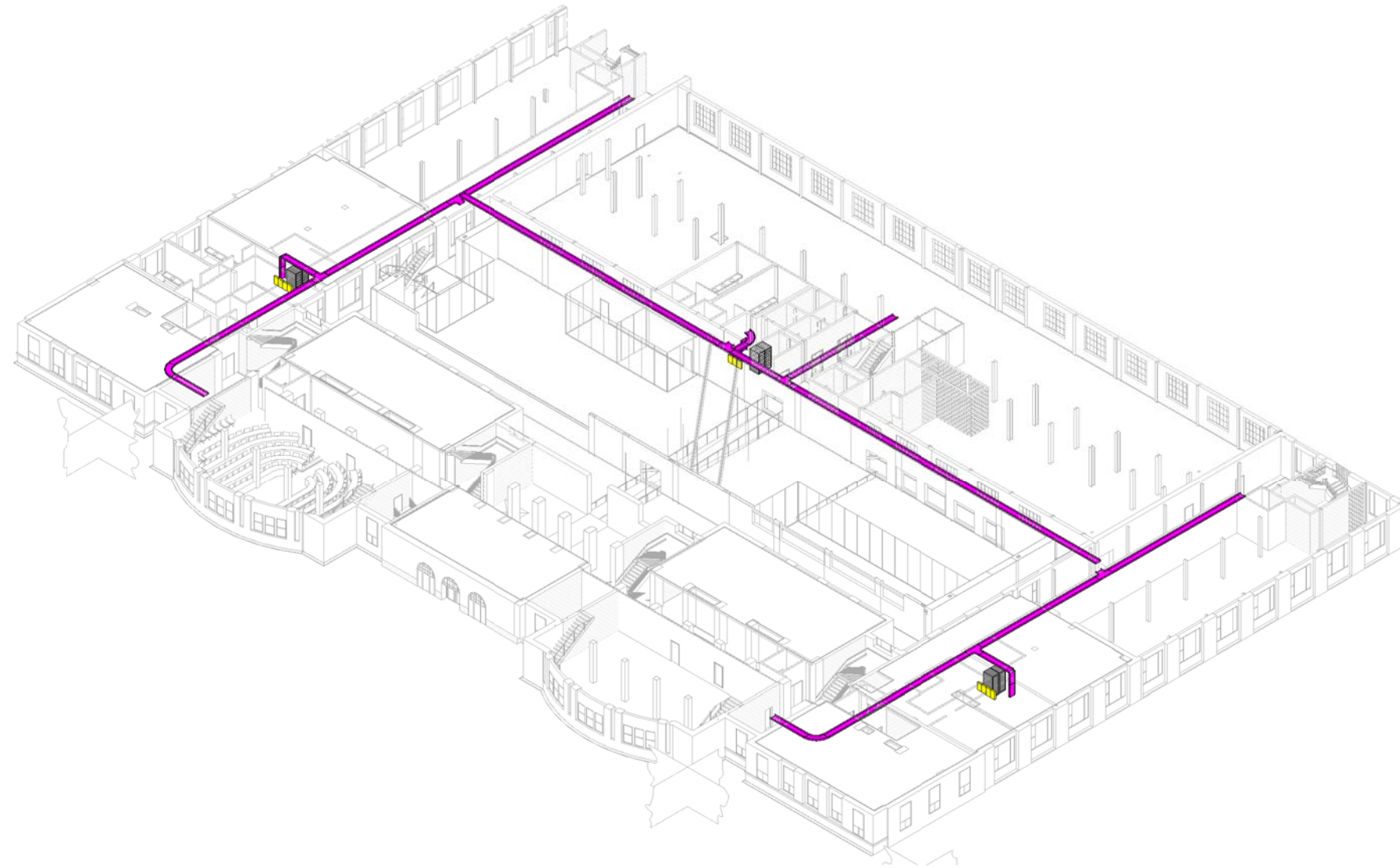
4 2- EAST WING CORRIDOR NORTH
E104 1:50

UL SHEET - ISO A1

7. Typical Floor Cable Tray

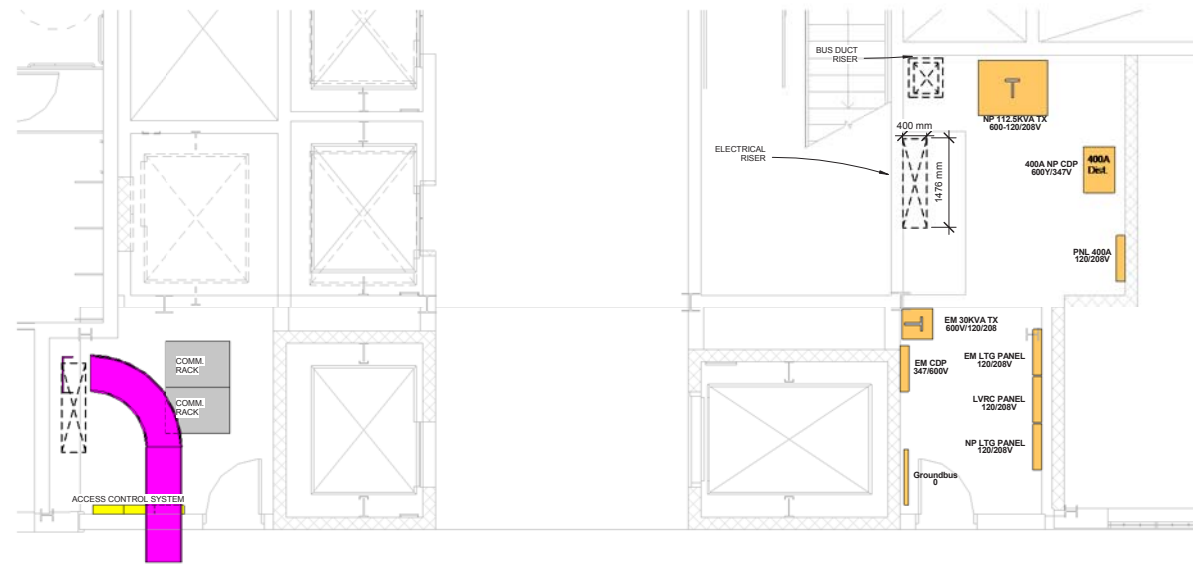
E.1 Electrical Drawings



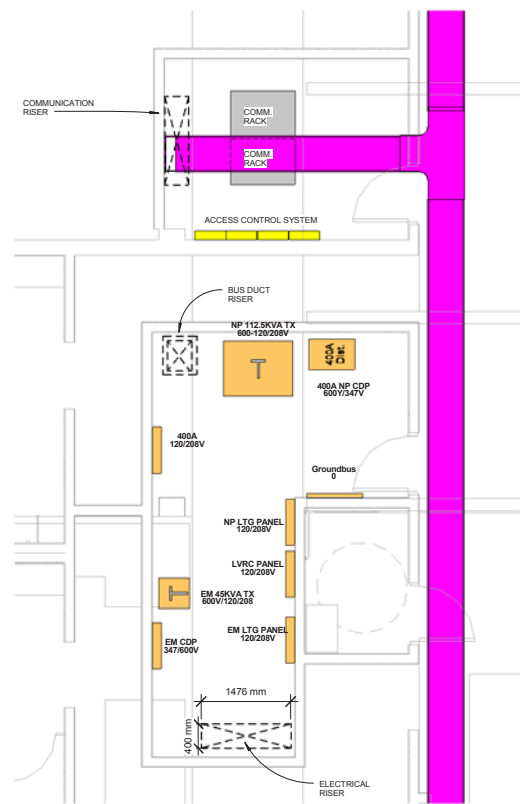


NOTES:
1. TYPICAL CABLE TRAY 610MM X 103MM
BASKET TRAY CABLOFIL OR EQUAL.
2. THE PURPOSE OF THIS DRAWING IS TO
INDICATE PROPOSED TYPICAL CABLETRAY
ROUTING ON TYPICAL FLOORS. EXACT
LOCATIONS AND ELEVATIONS SHALL BE
COORDINATED ON EVERY FLOOR.

8. Typical Floor Cable Tray Details

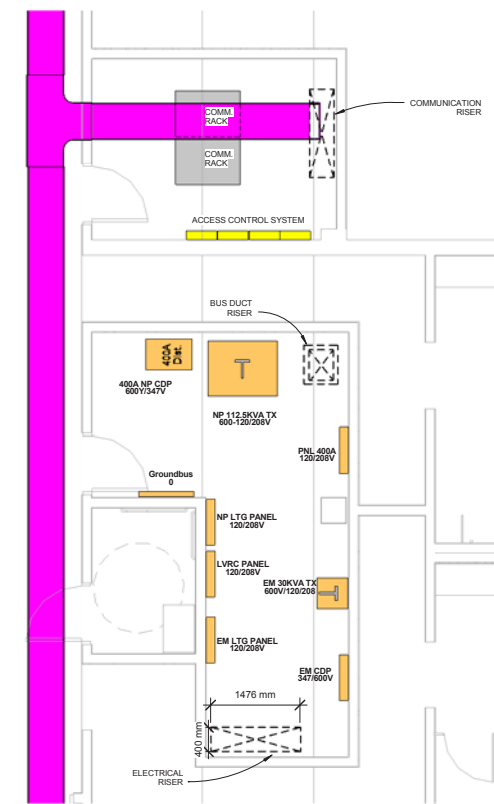


2 - TYPICAL NORTH WING ELECTRICAL AND COMM ROOM
E106 1:50



1 - TYPICAL WEST WING ELECTRICAL AND COMM ROOM
E106 1:50

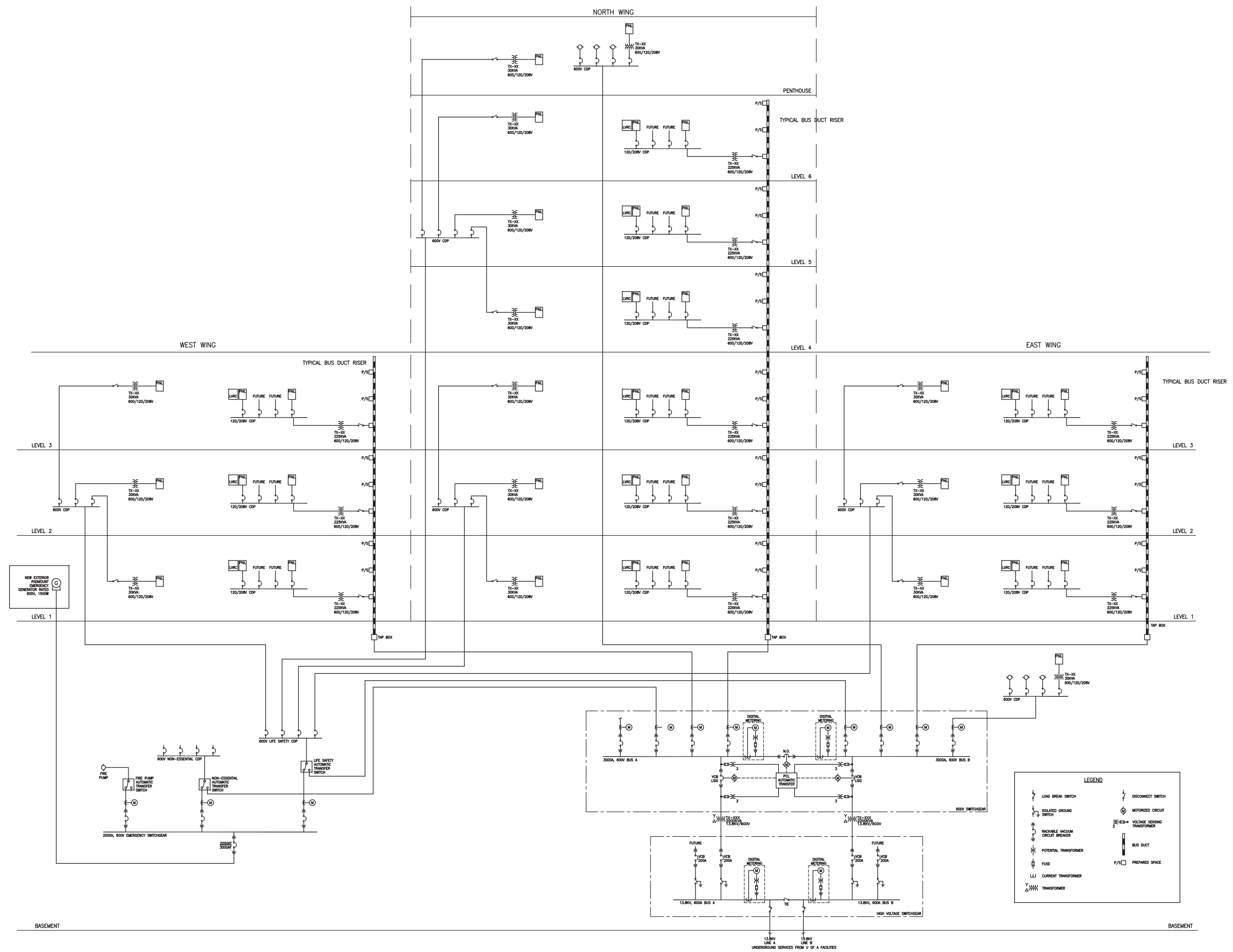
NOTES:
1. ALL CONDUIT AND CABLE TRAY SHOWN IS FOR THE PURPOSE OF CONCEPTUAL DESIGN AND DO NOT REFLECT EXACT QUANTITIES AND OR DIMENSIONS.



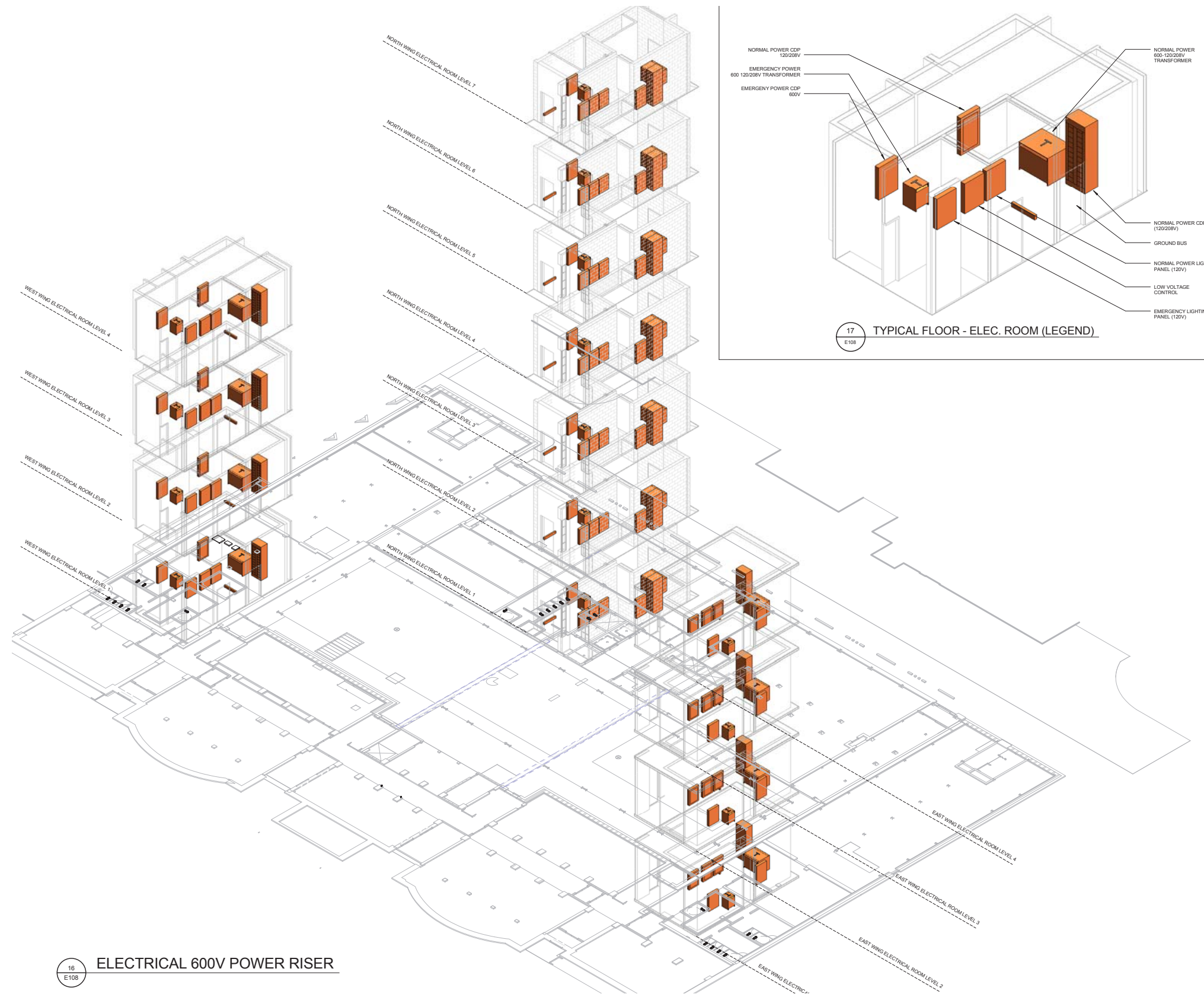
3 - TYPICAL EAST WING ELECTRICAL AND COMM ROOM
E106 1:50

9. Typical Floor Electrical and Communication Rooms





10. Electrical Single Line Diagram



16 E108 ELECTRICAL 600V POWER RISER

17 E108 TYPICAL FLOOR - ELEC. ROOM (LEGEND)

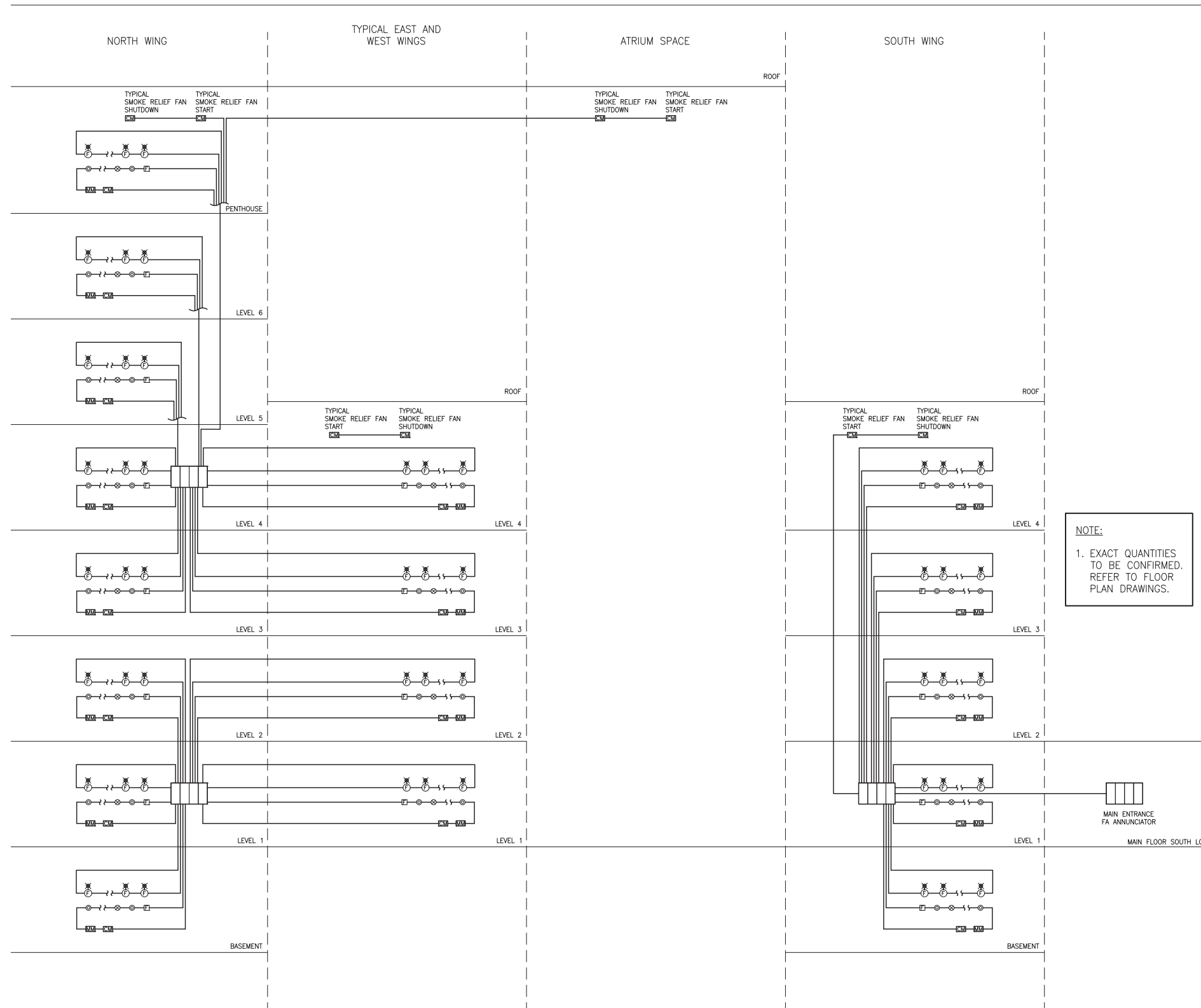
E.1 Electrical Drawings

11. Electrical Room Riser Diagram





12. Communication Room Riser Diagram



13. Fire Alarm Riser Diagram



E.1 Electrical Drawings

Electrical Service Equipment	Tag	Description	Location	Electrical		Comments
				Voltage	Capacity	
High voltage Switchgear	TBC with UofA Facilities	Main Tie Main Service Entranc switchgear	Basement	13.8KV	600A	Vaccum Circuti breakers complete with load break switch main-tie-main
High Voltage Switchgear Metering	TBC with UofA Facilities	Integral PT's and CT's and digital metering for Bus A and Bus B	Basement	Low Voltage	*	Metering to match U of A standards
High Voltage Transformer T-1	TBC with UofA Facilities	13.8KV / 600V Dry Type Step Down Transformer	Basement	600V Secondary	2000KVA	Fan Cooling under Review
High Voltage Transformer T-2	TBC with UofA Facilities	13.8KV / 600V Dry Type Step Down Transformer	Basement	600V Secondary	2000KVA	Fan Cooling under Review
Medium Voltage Switchgear	TBC with UofA Facilities	Main Tie Main 600V Switchgear	Basement	600V	3000A	Vaccum Circuit Breakers for Mains and Feeders complete with automatic transfer PLC for main-tie-main and Digital Metering Package (KAIC to be confirmed)
Bus Duct Riser (EAST WING)	TBC with UofA Facilities	Enclosed Bus Duct c/w serice fused Disconnect for distirbution	Basement to Penthouse	600V	TBC	Four Floors
Bus Duct Riser (WEST WING)	TBC with UofA Facilities	Enclosed Bus Duct c/w serice fused Disconnect for distirbution	Basement to Penthouse	600V	TBC	Four Floors
Bus Duct Riser (NORTH WING)	TBC with UofA Facilities	Enclosed Bus Duct c/w serice fused Disconnect for distirbution	Basement to Penthouse	600V	TBC	Four Floors
Generator G1	TBC with UofA Facilities	Base Building Emergency Generator	West Wing	600V	1500W	Exterior weather proof enclosure
Generator G2	TBC with UofA Facilities	Slow Poke Emergency Generator	West Wing	600V	200KW	Exterior weather proof enclosure(Refer to Slow poke Report)
Medium Voltage Emergency Switchgear	TBC with UofA Facilities	Emergency Switchgear	Basement	600V	2000A	
Automatic Transfer Switch ATS-1	TBC with UofA Facilities	Essential Life Safety Loads	Basement	600V	TBC	
Automatic Transfer Switch ATS-2	TBC with UofA Facilities	Non- Essential Loads	Basement	600V	TBC	
EM_CDP Life Safety Loads	TBC with UofA Facilities	CDP cw moulded case Circuit breakers	Basement	600V	TBC	To service all life safety building loads defined in ABC and CEC 22.1 Sec 46.
EM_CDP non essential Loads	TBC with UofA Facilities	CDP cw moulded case Circuit breakers	Basement	600V	TBC	To service all emergency power loads. To be defined by U of A.
LEVEL 1						
Normal Power Transformer (EAST Wing)	TBC with UofA Facilities	Normal power 600V to 120/208V transformer	Level 1	120/208V secondary	225KVA	Dry Type cw vibration isolation and drip hood.
Normal Power Transformer (WEST Wing)	TBC with UofA Facilities	Normal power 600V to 120/208V transformer	Level 1	120/208V secondary	225KVA	Dry Type cw vibration isolation and drip hood.
Normal Power Transformer (NORTH Wing)	TBC with UofA Facilities	Normal power 600V to 120/208V transformer	Level 1	120/208V secondary	225KVA	Dry Type cw vibration isolation and drip hood.
Emergency Power Transformer (EAST Wing)	TBC with UofA Facilities	Emergency power 600V to 120/208V transformer	Level 1	120/208V secondary	30KVA	Dry Type cw vibration isolation and drip hood.
Emergency Power Transformer (WEST Wing)	TBC with UofA Facilities	Emergency power 600V to 120/208V transformer	Level 1	120/208V secondary	30KVA	Dry Type cw vibration isolation and drip hood.
Emergency Power Transformer (NORTH Wing)	TBC with UofA Facilities	Emergency power 600V to 120/208V transformer	Level 1	120/208V secondary	30KVA	Dry Type cw vibration isolation and drip hood.
Normal Power CDP (EAST Wing)	TBC with UofA Facilities	Main Normal Power Distirbution	Level 1	120/208V secondary	800A	Sizing to be confirmed at DD
Normal Power CDP (WEST Wing)	TBC with UofA Facilities	Main Normal Power Distirbution	Level 1	120/208V secondary	800A	Sizing to be confirmed at DD
Normal Power CDP (NORTH Wing)	TBC with UofA Facilities	Main Normal Power Distirbution	Level 1	120/208V secondary	800A	Sizing to be confirmed at DD
Normal power Lighting Panel	TBC with UofA Facilities	Branch panelboard	Level 1	120/208V	100A	
Emergency Power Lighting Panel	TBC with UofA Facilities	Branch panelboard	Level 1	120/208V	100A	
Low Voltage lightng control Panel	TBC with UofA Facilities		Level 1	120/208V	100A	Barrier for normal and emergency circuits
House Panelboard(EAST Wing)	TBC with UofA Facilities	Core and Shell 120V electrical servie panel	Level 1	120/208V	100A	To service typical service cooridor loads and mechanical controls
House Panelboard(WEST Wing)	TBC with UofA Facilities	Core and Shell 120V electrical servie panel	Level 1	120/208V	100A	To service typical service cooridor loads and mechanical controls
House Panelboard(NORTH Wing)	TBC with UofA Facilities	Core and Shell 120V electrical servie panel	Level 1	120/208V	100A	To service typical service cooridor loads and mechanical controls
LEVEL 2						
Normal Power Transformer (EAST Wing)	TBC with UofA Facilities	Normal power 600V to 120/208V transformer	Level 2	120/208V secondary	225KVA	Dry Type cw vibration isolation and drip hood.
Normal Power Transformer (WEST Wing)	TBC with UofA Facilities	Normal power 600V to 120/208V transformer	Level 2	120/208V secondary	225KVA	Dry Type cw vibration isolation and drip hood.
Normal Power Transformer (NORTH Wing)	TBC with UofA Facilities	Normal power 600V to 120/208V transformer	Level 2	120/208V secondary	225KVA	Dry Type cw vibration isolation and drip hood.
Emergency Power Transformer (EAST Wing)	TBC with UofA Facilities	Emergency power 600V to 120/208V transformer	Level 2	120/208V secondary	30KVA	Dry Type cw vibration isolation and drip hood.
Emergency Power Transformer (WEST Wing)	TBC with UofA Facilities	Emergency power 600V to 120/208V transformer	Level 2	120/208V secondary	30KVA	Dry Type cw vibration isolation and drip hood.
Emergency Power Transformer (NORTH Wing)	TBC with UofA Facilities	Emergency power 600V to 120/208V transformer	Level 2	120/208V secondary	30KVA	Dry Type cw vibration isolation and drip hood.
Normal Power CDP (EAST Wing)	TBC with UofA Facilities	Main Normal Power Distirbution	Level 2	120/208V	800A	Sizing to be confirmed at DD
Normal Power CDP (WEST Wing)	TBC with UofA Facilities	Main Normal Power Distirbution	Level 2	120/208V	800A	Sizing to be confirmed at DD

E2 Preliminary Electrical Equipment List

E2. Preliminary Electrical Equip. List

Electrical Service Equipment	Tag	Description	Location	Electrical		Comments
				Voltage	Capacity	
Normal Power CDP (NORTH Wing)	TBC with UofA Facilities	Main Normal Power Distirbution	Level 2	120/208V	800A	Sizing to be confirmed at DD
Emergency Power CDP (EAST Wing)	TBC with UofA Facilities	Main Normal Power Distirbution	Level 2	120/208V	200A	
Emergency Power CDP (WEST Wing)	TBC with UofA Facilities	Main Normal Power Distirbution	Level 2	120/208V	200A	
Emergency Power CDP (NORTH Wing)	TBC with UofA Facilities	Main Normal Power Distirbution	Level 2	120/208V	200A	
Normal power Lighting Panel	TBC with UofA Facilities	Branch panelboard	Level 2	120/208V	100A	
Emergency Power Lighting Panel	TBC with UofA Facilities	Branch panelboard	Level 2	120/208V	100A	
Low Voltage lightng control Panel	TBC with UofA Facilities		Level 2	120/208V	100A	Barrier for normal and emergency circuits
House Panelboard(EAST Wing)	TBC with UofA Facilities	Core and Shell 120V electrical servie panel	Level 2	120/208V	100A	To service typical service cooridor loads and mechanical controls
House Panelboard(WEST Wing)	TBC with UofA Facilities	Core and Shell 120V electrical servie panel	Level 2	120/208V	100A	To service typical service cooridor loads and mechanical controls
House Panelboard(NORTH Wing)	TBC with UofA Facilities	Core and Shell 120V electrical servie panel	Level 2	120/208V	100A	To service typical service cooridor loads and mechanical controls
LEVEL 3						
Normal Power Transformer (EAST Wing)	TBC with UofA Facilities	Normal power 600V to 120/208V transformer	Level 3	120/208V secondary	225KVA	Dry Type cw vibration isolation and drip hood.
Normal Power Transformer (WEST Wing)	TBC with UofA Facilities	Normal power 600V to 120/208V transformer	Level 3	120/208V secondary	225KVA	Dry Type cw vibration isolation and drip hood.
Normal Power Transformer (NORTH Wing)	TBC with UofA Facilities	Normal power 600V to 120/208V transformer	Level 3	120/208V secondary	225KVA	Dry Type cw vibration isolation and drip hood.
Emergency Power Transformer (EAST Wing)	TBC with UofA Facilities	Emergency power 600V to 120/208V transformer	Level 3	120/208V	30KVA	Dry Type cw vibration isolation and drip hood.
Emergency Power Transformer (WEST Wing)	TBC with UofA Facilities	Emergency power 600V to 120/208V transformer	Level 3	120/208V	30KVA	Dry Type cw vibration isolation and drip hood.
Emergency Power Transformer (NORTH Wing)	TBC with UofA Facilities	Emergency power 600V to 120/208V transformer	Level 3	120/208V	30KVA	Dry Type cw vibration isolation and drip hood.
Normal Power CDP (EAST Wing)	TBC with UofA Facilities	Main Normal Power Distirbution	Level 3	120/208V	800A	Sizing to be confirmed at DD
Normal Power CDP (WEST Wing)	TBC with UofA Facilities	Main Normal Power Distirbution	Level 3	120/208V	800A	Sizing to be confirmed at DD
Normal Power CDP (NORTH Wing)	TBC with UofA Facilities	Main Normal Power Distirbution	Level 3	120/208V	800A	Sizing to be confirmed at DD
Normal power Lighting Panel	TBC with UofA Facilities	Branch panelboard	Level 3	120/208V	100A	
Emergency Power Lighting Panel	TBC with UofA Facilities	Branch panelboard	Level 3	120/208V	100A	
Low Voltage lightng control Panel	TBC with UofA Facilities		Level 3	120/208V	100A	Barrier for normal and emergency circuits
House Panelboard(EAST Wing)	TBC with UofA Facilities	Core and Shell 120V electrical servie panel	Level 3	120/208V	100A	To service typical service cooridor loads and mechanical controls
House Panelboard(WEST Wing)	TBC with UofA Facilities	Core and Shell 120V electrical servie panel	Level 3	120/208V	100A	To service typical service cooridor loads and mechanical controls
House Panelboard(NORTH Wing)	TBC with UofA Facilities	Core and Shell 120V electrical servie panel	Level 3	120/208V	100A	To service typical service cooridor loads and mechanical controls
LEVEL 4						
Normal Power Transformer (NORTH Wing)	TBC with UofA Facilities	Normal power 600V to 120/208V transformer	Level 4	120/208V	225KVA	Dry Type cw vibration isolation and drip hood.
Emergency Power Transformer (NORTH Wing)	TBC with UofA Facilities	Emergency power 600V to 120/208V transformer	Level 4	120/208V	30KVA	Dry Type cw vibration isolation and drip hood.
Normal Power CDP (NORTH Wing)	TBC with UofA Facilities	Main Normal Power Distirbution	Level 4	120/208V	800A	Sizing to be confirmed at DD
Normal power Lighting Panel	TBC with UofA Facilities	Branch panelboard	Level 4	120/208V	100A	
Emergency Power Lighting Panel	TBC with UofA Facilities	Branch panelboard	Level 4	120/208V	100A	
Low Voltage lightng control Panel	TBC with UofA Facilities		Level 4	120/208V	100A	Barrier for normal and emergency circuits
House Panelboard(NORTH Wing)	TBC with UofA Facilities	Core and Shell 120V electrical servie panel	Level 4	120/208V	100A	To service typical service cooridor loads and mechanical controls
LEVEL 5						
Normal Power Transformer (NORTH Wing)	TBC with UofA Facilities	Normal power 600V to 120/208V transformer	Level 5	120/208V secondary	225KVA	Dry Type cw vibration isolation and drip hood.
Emergency Power Transformer (NORTH Wing)	TBC with UofA Facilities	Emergency power 600V to 120/208V transformer	Level 5	120/208V secondary	30KVA	Dry Type cw vibration isolation and drip hood.
Normal Power CDP (NORTH Wing)	TBC with UofA Facilities	Main Normal Power Distirbution	Level 5	120/208V	800A	Sizing to be confirmed at DD
Emergency Power CDP (NORTH Wing)	TBC with UofA Facilities	Main Normal Power Distirbution	Level 2	120/208V	200A	
Normal power Lighting Panel	TBC with UofA Facilities	Branch panelboard	Level 5	120/208V	100A	
Emergency Power Lighting Panel	TBC with UofA Facilities	Branch panelboard	Level 5	120/208V	100A	
Low Voltage lightng control Panel	TBC with UofA Facilities		Level 5	120/208V	100A	Barrier for normal and emergency circuits
House Panelboard(NORTH Wing)	TBC with UofA Facilities	Core and Shell 120V electrical servie panel	Level 5	120/208V	100A	To service typical service cooridor loads and mechanical controls

Electrical Service Equipment	Tag	Description	Location	Electrical		Comments
				Voltage	Capacity	
LEVEL 6						
Normal Power Transformer (NORTH Wing)	TBC with UofA Facilities	Normal power 600V to 120/208V transformer	Level 6	120/208V secondary	225KVA	Dry Type cw vibration isolation and drip hood.
Emergency Power Transformer (NORTH Wing)	TBC with UofA Facilities	Emergency power 600V to 120/208V transformer	Level 6	120/208V secondary	30KVA	Dry Type cw vibration isolation and drip hood.
Normal Power CDP (NORTH Wing)	TBC with UofA Facilities	Main Normal Power Distirbution	Level 6	120/208V secondary	800A	Sizing to be confirmed at DD
Normal power Lighting Panel	TBC with UofA Facilities	Branch panelboard	Level 6	120/208V	100A	
Emergency Power Lighting Panel	TBC with UofA Facilities	Branch panelboard	Level 6	120/208V	100A	
Low Voltage lighitng control Panel	TBC with UofA Facilities		Level 6	120/208V	100A	Barrier for normal and emergency circuits
House Panelboard(NORTH Wing)	TBC with UofA Facilities	Core and Shell 120V electrical servie panel	Level 6	120/208V	100A	To service typical service cooridor loads and mechanical controls
Penthouse						
Normal Power Transformer (NORTH Wing)	TBC with UofA Facilities	Normal power 600V to 120/208V transformer	Penthouse	120/208V secondary	225KVA	Dry Type cw vibration isolation and drip hood.
Emergency Power Transformer (NORTH Wing)	TBC with UofA Facilities	Emergency power 600V to 120/208V transformer	Penthouse	120/208V secondary	30KVA	Dry Type cw vibration isolation and drip hood.
Mechanical Power CDP (NORTH Wing)	TBC with UofA Facilities	Main Normal Power Distirbution	Penthouse	120/208V secondary	800A	Sizing to be confirmed at DD
Emergency Power Panel Life Safety	TBC with UofA Facilities	Branch panelboard	Penthouse	120/208V	100A	
House Panelboard (NORTH Wing)	TBC with UofA Facilities	Core and Shell 120V electrical servie panel	Penthouse	120/208V	100A	To service typical service cooridor loads and mechanical controls

E2 Preliminary Electrical Equipment List

Section	Section Title	Pages
26 05 00	General Electrical Provisions.....	9
26 05 00.11	Work Included	2
26 05 00.12	Related Work Specified Elsewhere	1
26 05 00.24	Operations and Maintenance Manual	7
26 05 00.25	Equipment and Systems Demonstration and Instruction	2
26 05 00.26	Electrical Spare Parts and Maintenance Materials.....	2
26 05 19	Low-Voltage Electrical Power Conductors and Cables.....	3
26 05 26	Grounding and Bonding.....	1
26 05 29	Hangers and Supports for Electrical Systems	1
26 05 31	Splitters, Pull and Junction Boxes	2
26 05 33.11	Conduit	2
26 05 36.11	Cable Trays	2
26 05 36.12	Wire Mesh Cable Trays	2
26 05 48	Vibration and Seismic Controls for Electrical Equipment.....	2
26 05 53	Identification for Electrical Systems.....	3
26 05 73	Overcurrent Protective Device Coordination Study	1
26 06 20.16	Panelboards and Panelboard Schedules	3
26 08 00.10	Electrical Starting and Testing – General Requirements	1
26 08 00.11	Electrical Starting and Testing by Contractor.....	8
26 08 00.12	Electrical Performance Testing by Owner’s Testing Agent	8
26 08 00.13	Electrical Performance Testing Witnessed by Owner	1
26 09 16	Digital Metering.....	3
26 12 16	Substation Transformers	6
26 13 18	Switchboards.....	5
26 22 13	Low-Voltage Distribution Transformers	2
26 23 00	600 V Switchgear	11
26 24 13	Distribution Centres	2
26 24 19.22	Mechanical Equipment Controls.....	2
26 25 00	Enclosed Bus Assemblies	2
26 28 00	Low-Voltage Circuit Protective Devices	4
26 32 13	Engine Generators.....	1
26 32 13.01	Generator	2
26 32 13.11	Prime Mover	2
26 32 13.21	Integral Cooling	2
26 32 13.31	Exhaust Equipment	1
26 32 13.41	Starting System	2
26 32 13.42	Alarm and Instrumentation	3
26 36 23	Automatic Transfer Switches.....	4
26 43 00	Transient Voltage Suppression	4
26 60 10	Elevator Equipment Wiring.....	2
27 10 05	Telephone and Data Cabling System	12
28 31 02	Addressable Fire Alarm System	31
28 31 46	Smoke Aspiration Detection Systems.....	8

END OF INDEX

E2. Preliminary Electrical Equip. List E3. Electrical Specification Outline



- *Energy Analysis*

Preliminary Energy Modeling Results

University of Alberta
Dentistry Pharmacy Building Redevelopment

Introduction

A preliminary energy model was prepared for the University of Alberta Dentistry Pharmacy building. The model is based on the schematic design data provided. Analysis was conducted using eQuest, which is an energy simulation software tool which performs hourly simulation with the DOE 2 based engine. The purpose of this energy analysis is to provide a preliminary estimate of the energy use intensity of the building, compared to typical offices in Alberta. Finally, this memorandum provides recommendations to further improve performance. Energy consumption associated with the SLOWPOKE nuclear reactor is excluded from the analysis.

Current Energy Performance

Building energy performance of the renovated Dentistry Pharmacy building is shown in Figure 1. A typical office building in Alberta is presented as a basis of comparison.

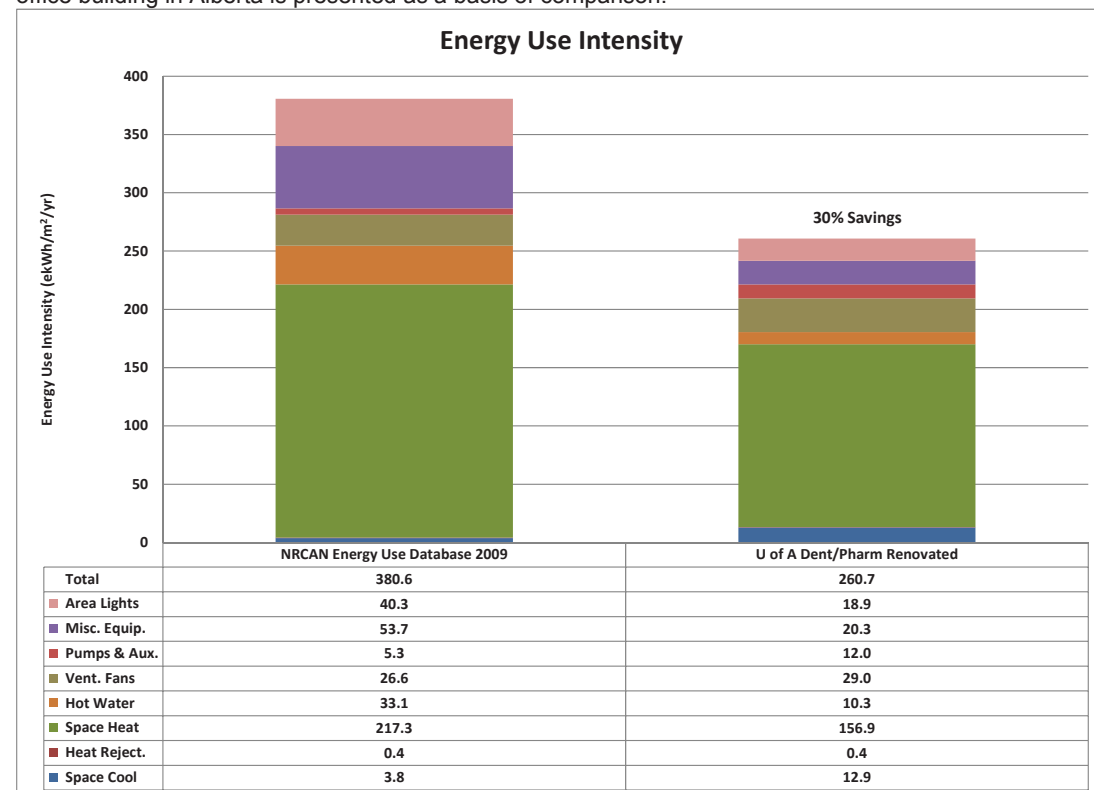


Figure 1: Energy Use Intensity Comparison

Upgrades assumed in the renovated Dentistry Pharmacy building include:

- Upgrade roof insulation
- New windows
- Installation of a heat recovery ventilator
- Installation of an atrium
- Chilled beam radiant heating and cooling

Discussion of Energy Use

Typical of most commercial buildings, space heat accounts for almost 60% of the total energy use in the building. Area lighting, combined with pumps and ventilation fans account for a further 25% of the energy use, while electrical plug loads, domestic hot water and space cooling account for the balance of energy use.

Table 1: Energy Model Input Summary Table

University of Alberta Dentistry Pharmacy Building Redevelopment	
General	
Location	Edmonton, Alberta
Climate Zone	ASHRAE Climate Zone 7
Building Type	Office Redevelopment
Floor Area Summary	Total: 32,660 m²
Envelope Performance	
Overall Roof R-value ¹ (m ² ·°C/W)	Increased Roof Insulation Insulation Above Deck: RSI-5.30
Overall Wall R-value (m ² ·°C/W)	Brick – no insulation: RSI-0.5 (average)
Percentage Glazing	36%
Overall Glass U-value including frame (W/ m ² ·°C), and Solar Heat Gain Coefficient ² (SHGC)	High Performance Windows Solarban 60 U-value _(center of glass) : 1.65 SHGC: 0.39
Shading Devices	No shading devices
Internal Loads	
Lighting Power Density (LPD) ³	Reduced Lighting Power Density Office: 7 W/m ² Service Spaces: 2.9 – 4.9 W/m ²
Lighting Controls	None
Plug Loads	Based on MNECB 1997 Table 4.3.2.A Building Type Categories: Default Assumptions Office: 7.5 W/m ²
Occupancy	Based on MNECB 1997 Table 4.3.2.A Building Type Categories: Default Assumptions 25 m ² /occ
Domestic Hot Water	eQuest Defaults
Design Conditions	

¹ Based on inputs from design team

² Based on inputs from design team

³ Based on inputs from design team



University of Alberta Dentistry Pharmacy Building Redevelopment	
Indoor Design Temperature	Heating: 22°C Cooling: 21°C Night Setback: Heating: 18°C Cooling: 28°C
Central Plant	
Heating Type	District Energy System: Steam from Campus utilities
Heating Efficiency	Modeled as 75% natural gas boiler
Hot Water Design Supply and Return Temperature	Supply: 82°C Return: 60°C
Cooling Type	District Energy System: Chilled water from Campus utilities
Cooling Efficiency	Modelled as centrifugal chiller w/ COP 4.0
Chilled Water Design Supply and Return Temperature	Supply: 7°C Return: 13°C
Domestic Hot Water	District Energy System: Steam from Campus utilities
Domestic Hot Water Efficiency	Modeled as 75% natural gas boiler
Pump Power	eQuest defaults
Mechanical Systems	
System Description	100% OA Ventilation Supply Chilled Beams to occupied spaces Radiant Panel in perimeter zones and atrium
Supply Air Temperature	OA Ventilation Unit 13°C Chilled Beam Units Heating: 35°C Cooling: 13°C
Fan Power	eQuest Defaults

F. Energy Analysis



OUTLINE OF ISSUE

Agenda Title: **GFC Facilities Development Committee (FDC) Learning Spaces Subcommittee (FDC LSS) Final Report**

Motion: THAT the GFC Facilities Development Committee endorse and forward the GFC FDC Learning Spaces Subcommittee (FDC LSS) Final Report to the Offices of the Provost and Vice-President (Academic) and Vice-President (Facilities and Operations) with a request for these Offices to use this report as the basis for guiding future learning space planning.

Item

Action Requested	<input type="checkbox"/> Approval <input checked="" type="checkbox"/> Recommendation <input checked="" type="checkbox"/> Discussion/Advice <input type="checkbox"/> Information
Proposed by	Colleen Skidmore, Chair, GFC FDC, and Vice-Provost and Associate Vice-President (Academic) and Co-Chair, GFC FDC Learning Spaces Subcommittee
Presenters	Colleen Skidmore, Chair, GFC FDC, and Vice-Provost and Associate Vice-President (Academic); and Bart Becker, Associate Vice-President (Facilities and Operations) and Co-Chair, GFC FDC Learning Spaces Subcommittee
Subject	GFC FDC Learning Spaces Subcommittee (FDC LSS) Final Report

Details

Responsibility	Vice-President (Facilities and Operations)
The Purpose of the Proposal is (please be specific)	“Over the past 20 years, Facilities and Operations has been a leader in Canada in the development and identification of best practices and principles around how the institution constructs, repurposes and renovates facilities and spaces. As the campus has changed and evolved, principles and practices for the design and development of learning spaces have been periodically reviewed and refreshed by both the institution and government. These reviews involve a variety of processes like design charettes, peer reviews and literature reviews. However, despite the excellent work, the wider academic community has not been aware, for the most part, of the processes that were used in designing new spaces. There was increasing interest expressed within the wider campus community about the quality of institutional learning spaces and about the design processes used in the development of these spaces. Two standing committees of GFC, the Committee on the Learning Environment (CLE) and the Facilities Development Committee (FDC), agreed that the process for development of learning spaces should be reviewed. In 2010, the Chairs of FDC and CLE agreed that a subcommittee be created (the Learning Spaces Subcommittee) that would identify and enhance current processes to aid in the planning and design of formal and informal learning spaces across all campuses.” (Excerpted from the FDC Learning Spaces Subcommittee Report)
The Impact of the Proposal is	See ‘Purpose’.
Replaces/Revises (eg, policies, resolutions)	N/A
Timeline/Implementation Date	With the endorsement by GFC FDC, this guiding and planning document will be received by the Offices of the Provost and Vice-President (Academic) and Vice-President (Facilities and Operations) subsequent to the November 22, 2012 meeting of GFC FDC. The communication process will include an informational update by the Office of the

Endorsed Item No. 5

	Associate Vice-President (Facilities and Operations) on an annual basis, commencing at the March 2013 meeting of the GFC FDC.
Estimated Cost	N/A
Sources of Funding	N/A
Notes	N/A

Alignment/Compliance

Alignment with Guiding Documents	<i>Dare to Discover, Dare to Deliver, 2011 Comprehensive Institutional Plan (CIP); Long Range Development Plan (LRDP)</i>
Compliance with Legislation, Policy and/or Procedure Relevant to the Proposal (please quote legislation and include identifying section numbers)	<p>1. Post-Secondary Learning Act (PSLA): The PSLA gives GFC responsibility, subject to the authority of the Board of Governors, over academic affairs (Section 26(1)) and provides that GFC may make recommendations to the Board of Governors on a building program and related matters (Section 26(1) (o)). Section 18(1) of the PSLA give the Board of Governors the authority to make any bylaws “appropriate for the management, government and control of the university buildings and land.” Section 19 of the <i>Act</i> requires that the Board “consider the recommendations of the general faculties council, if any, on matters of academic import prior to providing for (a) the support and maintenance of the university, (b) the betterment of existing buildings, (c) the construction of any new buildings the board considers necessary for the purposes of the university [and] (d) the furnishing and equipping of the existing and newly erected buildings [.] [...]” Section 67(1) of the <i>Act</i> governs the terms under which university land may be leased.</p> <p>2. GFC Facilities Development Committee (FDC) Terms of Reference – Section 3. Mandate of the Committee: “[...]”</p> <p>2. Delegation of Authority</p> <p>Notwithstanding anything to the contrary in the terms of reference above, the Board of Governors and General Faculties Council have delegated to the Facilities Development Committee the following powers and authority:</p> <p>A. Facilities</p> <p>1. To approve proposed General Space Programmes (Programs) for academic units.</p> <p>2. (i) To approve proposals concerning the design and use of all new facilities and the repurposing of existing facilities and to routinely report these decisions for information to the Board of Governors.</p> <p>(ii) In considering such proposals, GFC FDC may provide advice, upon request, to the Provost and Vice-President (Academic), Vice-President (Facilities and Operations), and/or the University Architect (or their respective delegates) on the siting of such facilities. (GFC SEP 29 2003)</p> <p>B. Other Matters</p> <p>The Chair of FDC will bring forward to FDC items where the Office of</p>

the Provost and Vice-President (Academic) and/or the Office of the Vice-President (Facilities and Operations), in consultation with other units or officers of the University, is seeking the advice of the Committee.

C. Studies

In light of the academic priorities set by General Faculties Council, to initiate studies, and respond to requests for studies, opinion, and information within the purview of its general responsibilities and make reports and recommendations to the appropriate office or committee. (GFC 29 Sep 2003)

D. Sub-Delegation

To appoint such subcommittees, and to delegate to such subcommittees or to the Vice-President (Facilities and Operations) such of its powers, duties and functions, or any part thereof, including the power of sub-delegation and subject to such conditions as it deems necessary. (GFC 29 SEP 2003)”

3. UAPPOL Space Management Policy and Space Management

Procedure: The respective roles of GFC FDC and the Vice-President (Facilities and Operations) with regard to institutional space management are set out in this Board-approved Policy and attendant Procedure. To access this policy suite on line, go to: www.uappol.ualberta.ca .

4. GFC Committee on the Learning Environment (CLE) Terms of Reference/3. Mandate of the Committee:

“The Committee on the Learning Environment is a standing committee of the General Faculties Council that promotes an optimal learning environment in alignment with guiding documents of the University of Alberta.

The Committee on the Learning Environment is responsible for making recommendations concerning policy matters and action matters with respect to the following:

[...]

b) To review and, as necessary, recommend to the GFC Academic Planning Committee and GFC Executive Committee as relates to the development and implementation of policies on teaching, learning, teaching evaluation, and recognition for teaching that promote the University Academic Plan.

c) To develop policies that promote ongoing assessment of teaching and learning through all Faculties and units.

d) To nurture the development of innovative and creative teaching practices.

e) To encourage the sharing and discussion of evidence about effective teaching and learning.

f) To promote critical reflection on the impact of broad societal changes in teaching and learning.

g) To promote projects with relevant internal and external bodies that offer unique teaching and learning opportunities that would benefit

the university community.

h) To consider any matter deemed by the GFC Committee on the Learning Environment to be within the purview of its general responsibility.

Notwithstanding anything to the contrary in the terms of reference above, the General Faculties Council has delegated to the Committee on the Learning Environment the following powers and authority:

To recommend to the GFC Academic Planning Committee and to the GFC Executive Committee broad policy directions for excellence in teaching and learning.”

5. GFC Academic Planning Committee (APC) Terms of Reference/3. Mandate of the Committee:

“The Academic Planning Committee (APC) is GFC's senior committee dealing with academic, financial and planning issues. As such, it is not only responsible to GFC (or the Board) for the specific matters itemized below, but may also ask to consider or recommend to GFC on any academic issue, including 1) those issues under the purview of other GFC committees, 2) any academic issue related to restructuring, 3) any research-related issue, or 4) issues linked to academic service units where those issues have a significant academic impact. In like manner, the President, Provost and Vice-President (Academic) or other Vice-Presidents may refer any matter to APC for consideration or recommendation to GFC. APC is also responsible to GFC for promoting an optimal learning environment for students and excellence in teaching, research, and graduate studies. (GFC 29 SEP 2003)

APC is responsible for making recommendations to GFC and/or to the Board of Governors concerning policy matters and action matters with respect to the following: [...]

5. Facilities

a. To recommend to the Board of Governors on policy matters regarding the planning and use of physical facilities. (GFC 29 SEP 2003)

b. To recommend to the Board of Governors on policy matters regarding the use of land owned or leased by the University. (GFC 29 SEP 2003)

c. To recommend to the Board of Governors on policy matters regarding standards, systems and procedures for planning and designing physical facilities.

d. To recommend to the Board of Governors on matters regarding planning and use of physical facilities where these facilities are deemed to have a significant academic and/or financial impact on the University. (The determination of what constitutes a "significant academic and/or financial impact" will be made by the Provost and Vice-President (Academic).

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	<p>6. Teaching and Learning</p> <p>a. To recommend to GFC on broad policy directions for excellence in teaching and learning in a manner that ensures accountability of all Faculties in this matter. [...]"</p>
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Routing (Include meeting dates)

Consultative Route (parties who have seen the proposal and in what capacity)	Vice-Provosts' Meeting – November 7, 2011 (discussion); GFC Facilities Development Committee – November 24, 2011 (discussion); GFC Committee on Learning Environment – December 7, 2011 (discussion); GFC Academic Planning Committee – March 14, 2012 (discussion)
Approval Route (Governance) (including meeting dates)	GFC Facilities Development Committee – November 22, 2012 (for Endorsement of FDC LSS Final Report)
Final Approver	GFC Facilities Development Committee – November 22, 2012

Attachments:

- Attachment 1 (pages 1–17): GFC Facilities Development Committee (FDC) Learning Spaces Subcommittee (LSS) Final Report (July 2012)

Prepared by: Cindy Watt, Committee Initiatives Manager, cindy.watt@ualberta.ca, and University Governance

FDC Learning Spaces Subcommittee Report

2012

FDC Learning Spaces Subcommittee (FDC LSS) Final Report July 2012

A. Introduction

A learning space is any space that provides for formal and/or informal learning. Our campus consists of many types of learning spaces, ranging from traditional classrooms and seminar space, to library and study space, to student community space, to learning spaces in residences. An overarching goal in the development of space should be harmonization of design and function.

All space on campus is University space. That is, a student studying in one faculty has access to buildings associated not only with their home faculty, but to all learning spaces on campus. The quality of learning spaces on our campus is central to the academic experience, and thus the overall university experience, of both learners and instructors. Institutions have opportunities when designing and constructing new buildings or renovating older spaces to ensure that spaces that are designated as either formal or informal learning spaces maximize and enhance the potential for learning. Furthermore, well designed learning spaces signal to the population of students, faculty, and staff that they are part of a world class institution – in that way, well designed learning space can help to promote the reputation of a University, just as poor learning spaces can detract from institutional reputation. A properly designed learning space can serve to attract and retain talented people, and inspire those people in their learning and discovery activities. Thus, it is important for us to have processes in place for the design and development of new and renovated learning spaces.

Over the past 20 years, Facilities and Operations has been a leader in Canada in the development and identification of best practices and principles around how the institution constructs, repurposes and renovates facilities and spaces. As the campus has changed and evolved, principles and practices for the design and development of learning spaces have been periodically reviewed and refreshed by both the institution and government. These reviews involve a variety of processes like design charrettes, peer reviews and literature reviews. However, despite the excellent work, the wider academic community has not been aware, for the most part, of the processes that were used in designing new spaces. There was increasing interest expressed within the wider campus community about the quality of institutional learning spaces and about the design processes used in the development of these spaces. Two standing committees of GFC, the Committee on the Learning Environment (CLE) and the Facilities Development Committee (FDC), agreed that the process for development of learning spaces should be reviewed. In 2010, the Chairs of FDC and CLE agreed that a subcommittee be created (the Learning Spaces Subcommittee) that would identify and enhance current processes to aid in the planning and design of formal and informal learning spaces across all campuses.

After consultation with GFC CLE, the Teaching, Learning and Technology Council (TLAT), and the Strategic Initiatives Group (SIG), it was deemed appropriate for such a subcommittee to be within the jurisdiction of FDC under GFC Policy (**Appendix 1**). At the GFC FDC meeting of February 23, 2010, the formation of a GFC FDC Subcommittee on Learning Spaces (FDC LSS) was approved.

At its meeting of October 28, 2010, FDC approved terms of reference and composition of the FDC Learning Spaces Subcommittee (**Appendix 2**), which established D. Marshall, Deputy Provost and FDC Chair, and B. Becker, Associate Vice-President, Facilities and Operations, as co-chairs of the Subcommittee.

The following tasks were identified for the subcommittee:

1. Identify principles for development and design of learning spaces that stimulate learning, discovery, creativity, and engagement.
2. Review and discuss current processes used for the planning and design of learning spaces on campus.
3. Identify gaps in current processes.
4. Identify barriers to principles identified in Task 1 that prevent the University from achieving optimal learning spaces.
5. Identify strategies to address gaps and barriers in the current process.
6. Identify recommendations.

The FDC LSS met 8 times during December, 2010 and June, 2011:

December 7: Review tasks and establish timelines to final reporting. At this meeting, the Subcommittee received a detailed review of the Space Management Manual which outlines standards for space allocation and management at the UofA. This manual applies to both existing and new space, and is a tool that is used by Facilities and Operations to ensure consistency in approach to the design and development of space across all campuses. The space categories in the Space Management Manual that are germane to this exercise were identified as being the following:

- Category 1: Classroom, Lecture and Seminar Space – Introduction
- Category 6: Library and Study Services Space
- Category 11: Student and Staff Housing Space
- Category 13: Student Community Space

January 27: Development of activities and timelines; review of current process for space planning (see **Appendix 3**: Planning and Design – Capital Projects through Approval Stages)

March 2: Setting the stage (Lisa Givens, Ben Louie reviewed literature and design principles); discussion of principles (design/operational) for the development of learning spaces

March 22: “Day in the life” exercise (exercise describing a typical day – followed by an ideal day - in the life of students, faculty and staff on campus related to learning spaces)

April 13: Design charette (using the Katz-Rexall atrium as the space)

April 27: Tour of Edmonton Clinic Health Academy (ECHA) and Centennial Center for Interdisciplinary Sciences (CCIS), followed by discussion of key principles for design and development of learning spaces

May 30: Review of preliminary recommendations

June 7: Review of draft report

June 30: Approval of Final Report

The discussions of the FDC LSS highlighted that learning happens everywhere on campus – classrooms, labs, faculty offices, residences, SUB, and other areas. This report, however, is limited to discussions related to those learning spaces outlined in the space management manual, categories 1 (classrooms), 6 (Libraries), 11 (student housing), and 13 (student community space), as highlighted above.

B. Principles for Planning and Design of Learning Spaces

The FDC LSS affirms, following a literature review, processes examined over the past 6 months, and debates and discussion, the following principles for design of learning spaces:

- Space on campus is **shared learning space** – we want a unified campus that encourages a sense of community rather than one which is territorial in nature.
- **Inclusivity and Accessibility** in order to create a **sense of community and connectivity** on campus. Building design should present an invitation and opportunities to explore the wider campus and should encourage cooperation and collaboration among disparate groups.
- **Safety and security** to promote a sense of well being in spaces. Special attention is required in design, including flooring, lighting, and attention to privacy considerations including locks, protocols/hours of operation.
- **Comfort and convenience** that encourage interaction with the environment and a balance between form and function. Important considerations include air quality, light, cleanliness, natural features, finishes, ergonomically friendly furniture, power sources, and appropriate work surfaces.
- Spaces should be **flexible** to adapt to a variety of pedagogical and learning styles. Flexible spaces should include furniture that is moveable and learning technology that is current and can accommodate various configurations.
- Spaces should be organized into **zones of operation** that allow for user choice and self-regulation, e.g., quiet/study space; meeting space; eating space; office space.
- Attention should be paid to **environmental stewardship by incorporating sustainable features** into the design of learning spaces (e.g., the terrazzo flooring in CCIS; wood paneling in ECHA; sustainable features within Triffo Hall).
- **Aesthetics are important** – buildings need to be functional, but spaces should inspire creative and innovative ideas.

- Every classroom on campus should have established **minimum standards for learning technology**.
- Spaces need to be designed to encourage **ease of day-to-day maintenance** and operation. Operation includes, but is not limited to, cleaning, waste management, utility consumption, and access.

Whether space is new, renewed, or repurposed, the incorporation of these planning and design principles will ensure that students, staff and faculty realize they are at a world class institution.

C. Current Processes used in Planning and Design of Facilities

The FDC LSS spent a considerable amount of time discussing current process used by Facilities and Operations in the planning and design of learning spaces. We highlight below each aspect of the current process (Appendix 3):

1. Facilities and Operations have developed a **Space Management Manual** that **outlines standards** for space on campus.
2. Each unit develops a **General Space Program (GSP)**, in consultation with Facilities and Operations and in accordance with the standards of the Space Management Manual. The GSP is a 5-7 year forecast of space needs for a unit.
3. Space is **planned and designed for a single unit or multiple units**. Space is planned and designed in accordance with the GSP of each unit.
4. Building planning and design, whether for new, expansion or repurposed buildings, aims to **support formal and informal learning**.
5. The goal of planning and design is to **align best practice and principles with available funding**. Value engineering is used to balance all needs within a prescribed budget.
6. **Users are consulted** early in the design process. Users are empowered to express needs that allow for optimal usage, balancing all program needs. Where it is not possible to meet with all users of space, user representatives are consulted and they are in turn to consult with those whom they represent.
7. Design process, where possible, include a **mock-up/virtual simulation** of the space designed to scale so that user feedback is maximized to address issues early. Where not possible, tours of other “like spaces” on campus occur.
8. Once a facility has been built there is an **ongoing stewardship processes** to ensure that the building is operating and being used as originally conceived. This stewardship process does allow for changes as required for immediate functional concerns, but a “break-in” period is established for users to acclimatize themselves on how best to work in the new

space. During this time, issues, concerns, and complaints are registered and reviewed in accordance with current university practices. Faculties, through the assigned individual responsible for building operations, work with Facilities and Operations to address concerns raised.

D. Gaps in Current Process

- Users do not appear to know that a space management manual exists on campus.
- There are some concerns relative to the consultation process in the planning and design of learning spaces. The challenge is gathering information from a variety of stakeholders who are often represented by a single individual or a smaller subset of people. In particular, it is important in the planning and design of learning spaces to ensure the student voice is heard.
- Operational principles and user education for common learning spaces should be developed in the facility planning and design phase. These should be revisited once the building is open.
- There is a lack of understanding on the purpose of value engineering and the changes that result, which if not communicated, may result in unmet expectations.
- There is a lack of “trickle down” communication from the project committees to the end users during all project phases, regardless of whether facilities are new, renewed, or repurposed.
- There is a lack of change management processes for those that may have to change their work practice or have a different work experience within the space as they move into new, renewed, repurposed space. Where possible, simulated or mocked space should be used as part of the planning process.
- Although there are informal tools, there is lack of a formal tool/program that captures lessons learned from one project that can then be passed on to future projects.
- Ensuring lessons learned from the Faculty or unit level are passed up to the design team for consideration on other and future projects.
- There is a lack of contingencies within budgets to allow for issues mitigation during the “break in” period of a new facility. Recently, this practice has been incorporated and accepted by government as a direct project cost on larger-scaled projects.
- The established process that allows faculties/departments/units to signal that there are issues with facilities in the planning and design phase is not managed consistently across the various faculties.

E. Barriers to Addressing Gaps

- Limited capital funding for new, renewal and repurposing projects.
- Although it is recognized that value engineering provides important budgetary options during the course of a project, the original design of learning spaces should be preserved whenever possible.
- There are two barriers with lessons learned – one is the lack of a formalized data base to capture lessons learned, and the second is the perceived failure to acknowledge or accept lessons learned.
- Lack of understanding of the different processes being used to identify representatives and communication methods across the institution - making sure we get the right people at the table
- Lack of change management procedures around personal work processes, where a change in work habits may be required as new or altered space is developed.
- The dynamic nature of the University with long construction time frames that result in new and different needs that often arise after move-in.

F. Strategies to Address Gaps and Barriers

1. Continue to promote the principle highlighted in the Comprehensive Institutional Plan that the academic enterprise drives capital, human and financial resources. Use this principal with funders, including government and private philanthropists to encourage increased levels of funding.
2. Continue to plan and design facilities during tough financial times, so that when money is available, we are ready with proposals for submission.
3. Formalize the process for collecting, recording and communicating lessons learned, so that project, faculty, staff, student and user issues are captured along with the corrective measures that were taken to resolve issues.
4. Establish project contingencies in budgets that can be allocated for change management. There should be adjustment factors based on type and complexity of space, as well as level of work process changes - not just as a percentage of project cost.
5. Work with Student Associations to develop a process that ensures student input at every stage of planning, design, and construction, as well as during the “break-in” period.
6. Maintain close liaison between Facilities and Operations and the Provost’s office to create awareness and maintain the capacity to find compromise. Both portfolios should work together to handle issues so that Facilities and Operations are not disconnected from academic program discussions.
7. Formalize a process/plan that would assess and prioritize every learning space on campus over a 10-year period. In the short term – develop a comprehensive list of learning spaces

and their relative condition; in the longer term – manage the list to bring all learning spaces across the institution to a minimum standard, as funding becomes available.

8. Utilize a variety of methods and time frames to survey users on functionality and utilization of learning spaces on campus.
9. To illustrate design and plans for end users use tours, mockups, and virtual simulations wherever possible.
10. To aid communication, consider an annual report from Facilities and Operations to FDC highlighting new space that has opened in that year, existing space that was renewed or repurposed, and number of learning spaces that have changed as a result. The report should also address the quality of learning space.
11. Develop a utilization and functionality metric to assist in evaluation of quality of space. This metric would balance usage with functionality and aesthetics.

G. Recommendations

Short Term (less than 3 years)

1. Any planning and design projects related to learning spaces should incorporate the principles in this document. Responsibility: Facilities and Operations. Timeline: immediate
 - a. Build in flexibility in new spaces that allow for future developments in pedagogy and learning to be incorporated.
Responsibility: Faculty, staff, students and administration of unit(s) undergoing facility improvements, in conjunction with Facilities and Operations.
 - b. Evaluate power supply required to support future learners.
Responsibility: academy and Facilities and Operations
 - c. Consider development of variety of types of space in new or repurposed buildings.
Responsibility: academy and Facilities and Operations
 - d. Focus on welcoming spaces in design (e.g., use of finishes such as wood, stone, etc)
Responsibility: Facilities and Operations
 - e. Maximize use of natural light in design of spaces; where this is not possible, pay careful attention to lighting.
Responsibility: Facilities and Operations
 - f. Encourage incorporation of special features into design of space that enhance creativity and reputation.
Responsibility: academy and Facilities and Operations
2. There should be coordination of effort in the planning and design of learning spaces, and this effort should extend to education of and communication with users.
Responsibility: Provost's Office, Facilities and Operations, Faculty administration.
Timeline: immediate.

3. Continue and expand education and communication around current policy and procedures on space planning and development.
Responsibility: Provost's Office, Facilities and Operations
Timeline: 1 year
4. Evaluate the current stewardship process that occurs post-construction to ensure that the building is functioning as originally planned, while adapting to program changes.
Operation/oversight committees must be diligent in listening and relaying the voices of the users they represent.
Responsibility: Unit, Facilities and Operations, Provost's Office.
Timeline: 1 year
5. Develop minimum standards for technology in learning spaces on campus.
Responsibility: academy and AICT
Timeline: 1 year
6. In addition to renewal and repurposing of existing facilities and building of new facilities, there should be periodic review of existing learning spaces on campus to ensure that learner needs are being met.
Responsibility: Facilities and Operations, FDC
Timeline: 2 years to develop the initial inventory
7. Establish a change management process for end users as part of the facility planning and design process.
Responsibility: unit with Facilities and Operations.
Timeline: on-going.

Long Term (greater than 3 years)

1. Renew or repurpose existing learning spaces in accordance with the 10 year plan that Facilities and Operations develops, as funding becomes available.
Responsibility: Facilities and Operations, FDC
Timeline: continuous
2. Identify common learning spaces that share functionality, including the type of pedagogy used in the space.
Responsibility: Provost's Office, CLE, Centre for Teaching and Learning
Timeline: 3 years
3. Assess processes for planning and design of learning spaces not captured within this report (e.g., laboratories, faculty offices, residence living quarters, and other areas).
Responsibility: FDC subcommittee
Timeline: 4-5 years
4. Review processes for the development of learning spaces.

Responsibility: FDC subcommittee.
Timeline: every 5-7 years

APPENDIX 1 – GFC FDC Jurisdiction

1. **Post-Secondary Learning Act (PSLA):** The *PSLA* gives GFC responsibility, subject to the authority of the Board of Governors, over academic affairs (Section 26(1)) and provides that GFC may make recommendations to the Board of Governors on a building program and related matters (Section 26(1) (o)). Section 18(1) of the *PSLA* give the Board of Governors the authority to make any bylaws “appropriate for the management, government and control of the university buildings and land.” Section 19 of the *Act* requires that the Board “consider the recommendations of the general faculties council, if any, on matters of academic import prior to providing for (a) the support and maintenance of the university, (b) the betterment of existing buildings, (c) the construction of any new buildings the board considers necessary for the purposes of the university [and] (d) the furnishing and equipping of the existing and newly erected buildings [...] [...]” Section 67(1) of the *Act* governs the terms under which university land may be leased.

2. **GFC Facilities Development Committee (FDC) Terms of Reference – Section 3. Mandate of the Committee:** “[...]”

Delegation of Authority: Notwithstanding anything to the contrary in the terms of reference above, the Board of Governors and General Faculties Council have delegated to the Facilities Development Committee the following powers and authority:

A. Facilities

1. To approve proposed General Space Programmes (Programs) for academic units.

2. (i) To approve proposals concerning the design and use of all new facilities and the repurposing of existing facilities and to routinely report these decisions for information to the Board of Governors.

(ii) In considering such proposals, GFC FDC may provide advice, upon request, to the Provost and Vice-President (Academic), Vice-President (Facilities and Operations), and/or the University Architect (or their respective delegates) on the siting of such facilities. (GFC SEP 29 2003)

B. Other Matters

The Chair of FDC will bring forward to FDC items where the Office of the Provost and Vice-President (Academic) and/or the Office of the Vice-President (Facilities and Operations), in consultation with other units or officers of the University, is seeking the advice of the Committee.

C. Studies

In light of the academic priorities set by General Faculties Council, to initiate studies,

and respond to requests for studies, opinion, and information within the purview of its general responsibilities and make reports and recommendations to the appropriate office or committee. (GFC 29 Sep 2003)

D. Sub-Delegation

To appoint such subcommittees, and to delegate to such subcommittees or to the Vice-President (Facilities and Operations) such of its powers, duties and functions, or any part thereof, including the power of sub-delegation and subject to such conditions as it deems necessary. (GFC 29 SEP 2003)”

3. **UAPPOL Space *Management Policy and Space Management Procedure***: The respective roles of GFC FDC and the Vice-President (Facilities and Operations) with regard to institutional space management are set out in this Board-approved Policy and attendant Procedure. To access this policy suite on line, go to: www.uappol.ualberta.ca .

APPENDIX 2

GFC Facilities Development Committee (FDC) Learning Spaces Subcommittee Terms of Reference

Purpose:

To identify new, and enhance current, processes to aid in the planning and design of formal and informal learning spaces across all campuses.

Definition of Learning Space:

A learning space can be any space that provides for formal and/or informal learning. The *Facilities and Operations Space Categories and Relationship Matrix* is part of the *Space Management Manual* and is used for space distribution on campus and includes the following categories related to learning spaces:

- Category 1 (Classroom, Lecture and Seminar Space – Instruction)
- Category 6 (Library and Study Services Space)
- Category 11 (Student and Staff Housing Space)
- Category 13 (Student Community Space)

The Space Management Manual is a set of guidelines, standards and benchmarks to aid in the management, evaluation, planning, and design of all campus building spaces. All but one of the space categories align with those used in *Alberta Infrastructure's Post-Secondary Space Classification System* – Clinical Space has been added to accommodate the University's specific needs. The categories selected (1, 6, 11 and 13) are those related specifically to the terms and reference of the FDC Learning Spaces Subcommittee. (See Attachment 1 - *Facilities and Operations Space Categories and Relationship Matrix* for all categories and definitions):

Tasks:

7. Identify principles for development and design of learning spaces that stimulate learning, discovery, creativity, and engagement.
8. Review and discuss current processes used for the planning and design of learning spaces on campus.
9. Identify gaps in current processes.
10. Identify barriers to principles identified in Task 1 that prevent the University from achieving optimal learning spaces.
11. Identify strategies to address gaps and barriers in the current process.
12. Identify recommendations.

Potential Strategies for Committee:

- Design Charette on learning space
- Literature search
- Dialogue/debate
- Focus groups

- Facility tours
- Presentations

Outcome:

Recommendations to GFC Facilities Development Committee for renewing of current, and design and development of new formal and informal learning spaces.

Subcommittee Composition*:

Co-Chairs	<i>ex officio</i>	D. Marshall, Deputy Provost B. Becker, Associate Vice-President, Facilities and Operations
CLE Member		Lisa Given
FDC/CLE Member		Frank Nargang
FDC Member		Jose da Costa
TLAT Member		Trevor Woods
GSA Representative		Nima Yousefi Moghaddam
SU Representative		Zach Fentiman
Undergraduate Student-at-large		Amanda Lim/Bryanna Rouselle
Graduate Student-at-large		Vikki Northrup
NASA Representative		Russell Eccles
University Architect		Ben Louie
Learning Services		Ernie Ingles
Academic Information and Communication Technology (AICT) Representative		Trevor Woods
Ancillary Services Representative		Dima Utgoff

*The Subcommittee may engage individuals who are not members to assist on an *ad hoc* basis with specific tasks or strategies.

Facilities and Operations Space Categories and Relationship Matrix

Assignable Space Categories	Explanation
1. Classroom, Lecture and Seminar Space - Instruction	Assignable space primarily used for scheduled instruction that is not tied to a specific subject or discipline due to equipment or configuration; includes tiered and non-tiered rooms, related service spaces and break-out rooms; may include spaces for interD student learning and collaboration. To the maximum extent possible, Category 1 space is centrally scheduled.
2. Laboratory, Shop and Studio Space - Instruction	Assignable space used for instruction that requires special purpose equipment, furnishings and/or room configuration that ties the instruction to a specific curriculum component or discipline(s); activities include student participation, experimentation, observation or practice in a field of study; includes related service spaces and may include specialty spaces such as teaching clinics, animal facilities and greenhouses; excludes staff offices. Most Category 2 space is scheduled although some types are used on a more informal basis such as studios, workrooms and practice rooms.
3. Research Space - Laboratories, Shops, Project Space and Other Research Space	Assignable space used primarily by Faculty, graduate students and research staff for laboratory experimentation, research or training in research methods, professional research and observation, interD and collaborative research, or structured creative activity with a research purpose; includes related service spaces and may include specialty spaces such as animal facilities and greenhouses; excludes staff offices. Most of the University's farm space is reported under this category as its prime use is for research.
4. Academic Offices and Related Services Space	Assignable office space (individual, multi-person, workstation, etc.) used for academic and research staff, academic department leadership and direct administration, and graduate students; may be dedicated or shared (i.e. hotelling); includes agencies, centres or institutes that are linked to University core instruction or research function; includes related services spaces and program/ discipline-specific libraries, meeting rooms, teleconference and videoconference rooms that are non-instructional, and non-public lounges; may also include 'informal' interD and collaboration space for academic and research staff and graduate students.
5. Administrative Offices and	Assignable office space (individual, multi-person, workstation, etc.) used for staff in central administration units, non-

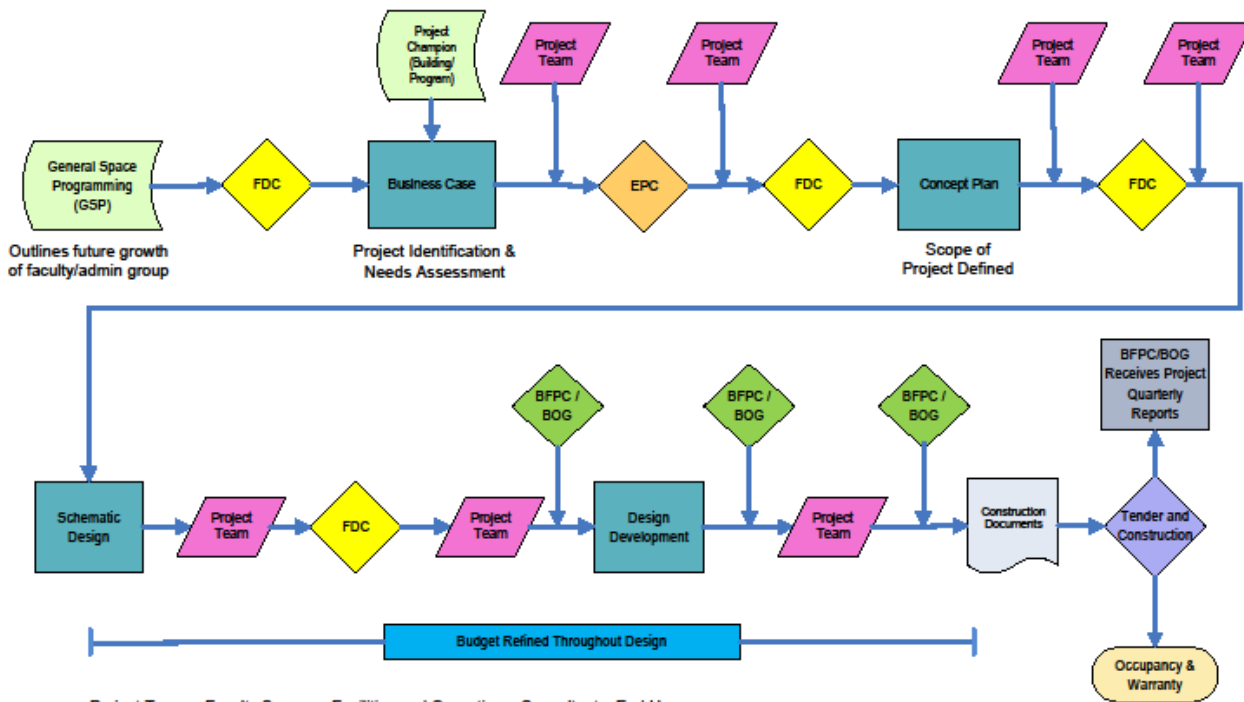
Assignable Space Categories	Explanation
Related Services Space	academic and student support service units (i.e. all office space not included under Academic or Ancillary); may be dedicated or shared (i.e. hotelling); includes related services spaces as well as meeting rooms, teleconference and videoconference rooms that are non-instructional, and non-public lounges.
6. Library and Study Services Space	Assignable space used for the acquisition, processing, storage, circulation, and study of multiple forms of library holdings, learning resource materials, digital information and media; includes areas for study and accessing technology, including those enclosed in a library facility and those distributed throughout the campus; Note: CAFM includes library offices and related service spaces.
7. Athletic Space	Assignable indoor space used by students, staff and/or public for athletic, physical education or wellness activities; includes related service spaces; excludes outdoor athletic fields.
8. Farm Space	Assignable indoor space for animal handling or shelter or for handling, storage or protection of agricultural products, materials, supplies, vehicles or implements; includes related farm operation service areas; excludes farm space, animal care and greenhouse space used primarily for instruction or research purposes (included under Categories 2 and 3); excludes outdoor fields, gardens, plots, etc.
9. Central Support Services Space	Assignable space for the physical and logistical services/departments/units essential to the operation of the University but not directly involved in a public service or University core instruction or research function; includes services that generally are centralized/campus-wide such as: materiel management storage and warehousing, central mail, computing and telecommunications, environmental testing and monitoring, physical plant maintenance, printing/duplicating/binding, security, shipping/receiving, vehicle shops/storage, etc.
10. Assembly and Exhibition Space	Assignable space for large assemblies or exhibition and display, that is not tied to a program or research function but is part of the University learning experience and/or community service role; includes theatres, auditoria, chapels, presentation areas/pavilions and similar spaces, as well as general- use museums, galleries, planetariums and exhibition areas not used primarily for instruction or research; includes related service spaces. Assembly and exhibition space primarily accessed by non-University users is classified as 12.

Assignable Space Categories	Explanation
	Ancillary space.
11. Student and Staff Housing Space	Assignable space used for student or staff housing that is owned or leased by the University; includes non-residential areas directly serving the housing.
12. Ancillary Operations Space	Assignable space allocated to revenue generating operations that serve the internal and external constituencies of the University and not used for the delivery or support of University core instruction or research functions; includes spaces such as: conferencing and related service facilities, day care facilities, food and related service facilities, merchandising and related facilities, and space allocated on a lease or grant basis to non-University users and affiliates of the University involved in research and development, commercialization and applied innovation.
13. Student Community Space	Assignable indoor space allocated primarily for student socialization, quality of life and personal/community activity such as: lounge, leisure and game facilities and related service spaces, and student association facilities. Similar space that is part of student/staff housing is reported in Category 11. Excludes outdoor quads.
14. Unclassified Space	Assignable space that is unavailable for allocation such as areas that are inactive, out-of-service, under renovation, in transition, shell space, etc.
15. Parking Space	Assignable space such as stand-alone parkades, attached parkades and parking areas located within building envelopes form part of the University's GFA. Portions of the space allocated to other uses are reported in the appropriate category. Surface parking lots are part of site.
16. Clinical Space	Assignable space, owned or operated by the University, that is used primarily for diagnosis, consultation, treatment or other similar services to patients or clients. Clinical space may include the attributes of teaching, research and/or public service and is typically associated with the Health Sciences faculties but may extend to other faculties such as Education.

APPENDIX 3

Planning and Design – Capital Projects through Approval Stages

Capital Project Governance and Review Flow Chart



Project Team – Faculty Sponsor, Facilities and Operations, Consultants, End Users
 FDC – Facilities Development Committee
 EPC – Executive Planning Committee
 BFPC – Board Finance and Property Committee
 BOG – Board of Governors

◆ Approval Points