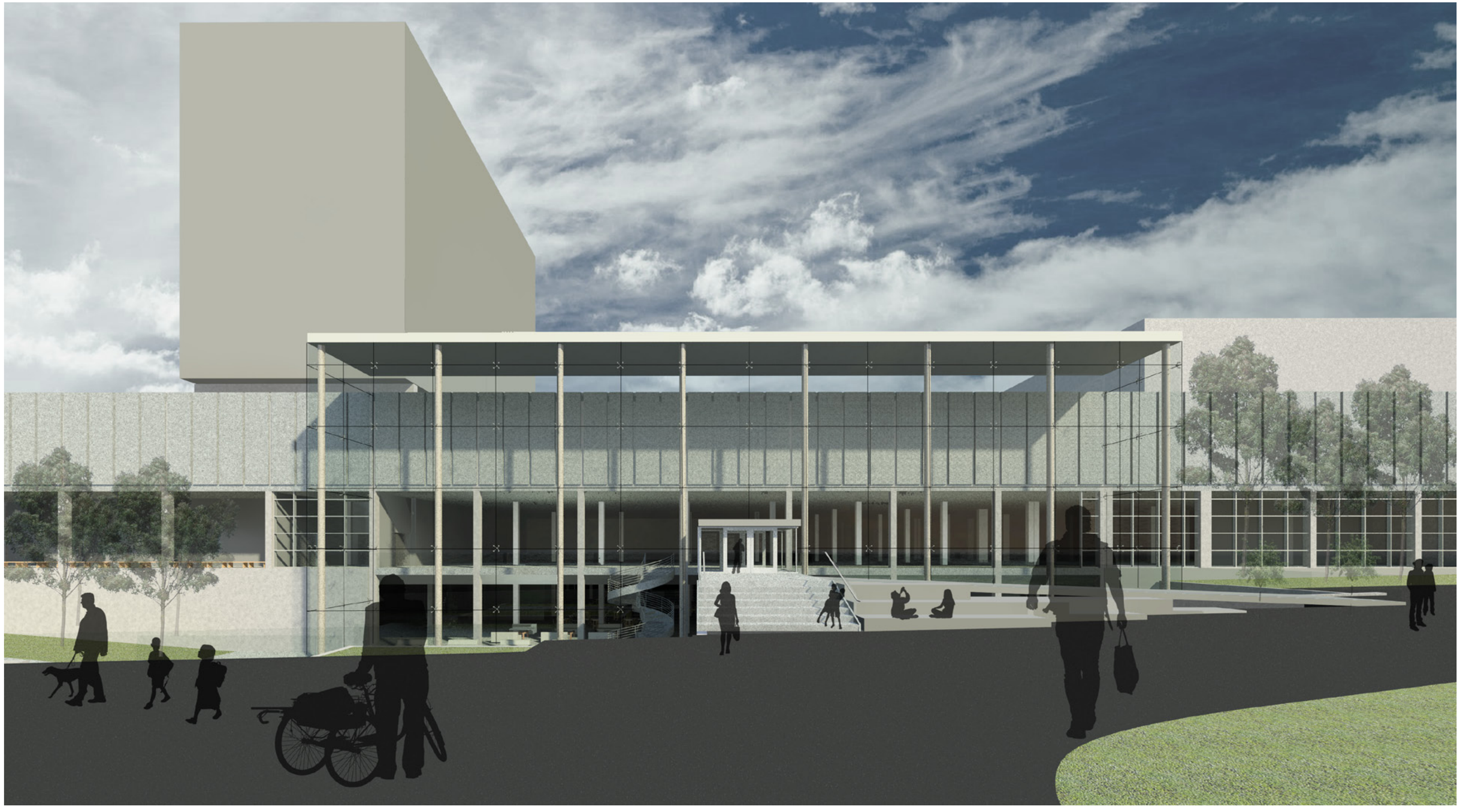
DIALOG™

SUB

RENOVATION + ADDITION
FEASIBILITY STUDY
January 20, 2012



Executive Summary

The University of Alberta Students' Union is the student society that represents the University's undergraduate students. With an annual budget of approximately $10,000,000 and hundreds of paid and volunteer staff, the Students' Union serves as an advocate for students and provides a variety of services to its members. The Students' Union building is heavily used and sees over 20,000 visitors on an average term weekday.

The Students' Union is committed to ensuring the active renewal and evolution of its space to meet the needs of students. In order to do so, they have renovated and expanded the building several times, most recently in 2002. The last renovation focused on enclosing the open courtyards and expanding student spaces on the Main Floor including a new food court, lounge and study areas—making it one of the most successful and well used student amenity spaces on campus.

To expand upon this success, the Students' Union commissioned this feasibility study. The objective was to create a design that would achieve goals based on their *Strategic Plan 2011-2014* as follows:

- Reinforce the role of the Students' Union Building as a primary centre of undergraduate activity engaging students in the full spectrum of social and service activities;

- Realign space within the Students' Union Building to better accommodate those services that serve undergraduate student needs; and;

- Reorganize the building's internal circulation to make way finding easier and enhance the building's overall image.

Strategic Goal 2

Establish an environment that promotes student spirit and involvement, and maximizes students' sense of ownership of the Students' Union and their university experience.

Strategic Goal 5

Support the educational and university experience of students by providing relevant programs and services.

The Project team consists of the Students' Union project Steering Committee; Russell Steffes Management Inc. the Students' Union Project Manager; DIALOG, the project architecture and engineering consultants; and Tuner and Townsend Inc., the project cost consultants. The Students' Union steering committee includes:
Marc Dumouchel - General Manager
Margriet Tilroe - West Senior Manager, Facilities and Operations
Andy Cheema - Vice President, Finance and Operations.
Student Counselors

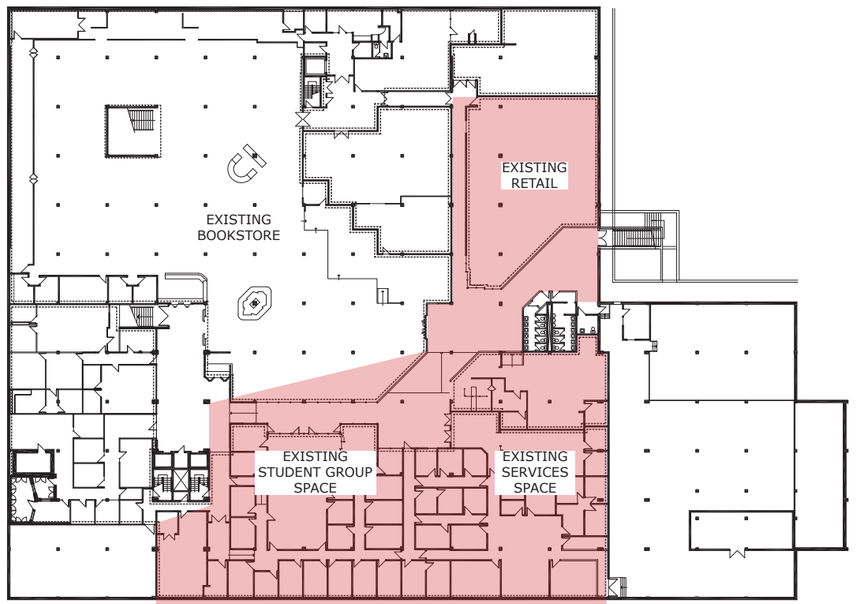
The team undertook a process of consultation with various client groups in order to solicit input for the design and better understand strategic goals. Design options and precedent images developed were further reviewed with client groups to gather feedback and refine the proposed design. The design concept adds a large glazed volume to the exterior of the South Façade which accomplishes a variety of objectives. The design respects the integrity of the 1967 Architecture while updating it with a contemporary image, an open, daylit basement interior space, reorganized and open basement floorplate promoting better circulation, wayfinding and improved student experience. Innovative mechanical systems make use of the glazed volume to achieve energy efficient passive solar heating and cooling.

Turner and Townsend provided a preliminary, order of magnitude, construction cost estimate based on the preliminary drawings and engineering reports prepared by DIALOG.

These construction costs were further vetted and supplemented with information provided by the project manager, Russell Steffes, to establish the total cost of the project. The total construction cost is estimated to be $8,556,000. The estimated project cost, which includes, the construction cost as well as furnishings, fixtures, equipment and fees, is $10,340,615.

In order to proceed forward, confirmation of funding support for the proposed budget will be required to initiate detailed design development and construction/contract documents in preparation for a stipulated bid tender or other procurement method as determined appropriate by the team. Through the process of the technical investigation and development required in this process, budget and scope will be refined to meet approved funding limits.

Once the project is approved to proceed, a critical path schedule will be developed to provide targets and milestones to focus the efforts and decision making of the team. It is expected that the scale of construction will require approximately 14 months to construct and commission. If approval to proceed is given by March of 2012, it is anticipate that the building could potentially be ready for occupancy by late 2013, early 2014. The potential for phasing, timing construction to minimize heating and hoarding costs and discovery of unforeseen conditions are factors that will require consideration when developing the final schedule and moving the project forward.



EXISTING LOWER LEVEL PLAN

Background

The Students' Union Building, constructed with Students' Union funds in 1967, continues to be one of the main student social and services hubs on campus. The building has been renovated and expanded first in 1993 and then in 2002 to serve the needs of an expanding undergraduate population. The undergraduate population continues to grow, with full time enrolment from 24,912 in 2002 and 29,100 in 2010 (footnote University of Alberta summary of statistics Academic Year 2010/ 2011). Further growth is expected in the future.

In contrast to a vibrant, animated and attractive Main Floor, SUB's Lower Floor is characterized by circuitous circulation and a rabbit's warren of unattractive, cramped and under utilized spaces. The Students' Union determined that the Lower Floor Level would be better utilized and attract more student use if it could be made more functional and attractive.

The Students' Union also operates a number of businesses, manages various targeted trust funds, hosts a wide variety of entertainment and educational events, and runs the Students' Union Building.

Project Methodology

The project terms of reference established a methodology that fostered student group involvement and feedback. Meetings were convened with stakeholders to establish priorities and confirm requirements. DIALOG initiated the design process by providing the Students' Union with precedent images that reflected stakeholder priorities. Regular design review meetings were held with the Steering Committee to confirm direction and provide feedback. Presentations were made to specific stakeholder groups and the Students' Union to solicit feedback and confirm overall support for the project.

DIALOG's architectural and engineering teams reviewed existing drawings, toured the building and met with the University's maintenance staff to familiarize themselves with the existing systems. The design recommendations provided in this report are based on the information gathered in this process and the proposed design solution.

In order to proceed forward, confirmation of funding support for the proposed budget will be required to proceed with detailed design development and construction / contract documents in preparation for a stipulated bid tender or other procurement method as determined appropriate by the team. Through the process of the technical investigation and refinement required in this process, budget and scope will be refined to meet approved funding limits.

Once the project is approved to proceed, a critical path schedule will be developed to provide targets and milestones to focus and measure the efforts and decision making of the team. It is expected that the scale of construction will require approximately 14 months to construct and commission. If approval to proceed is given by March of 2012, it is expected that the building could potentially be ready for occupancy by late 2013, early 2014. The potential for phasing, timing construction to minimize heating and hoarding costs and discovery of unforeseen conditions are factors that will require consideration when developing the final schedule and moving the project forward.

SUB - EXISTING STUDENT GROUP SERVICES IN THE LOWER LEVEL

Design Priorities

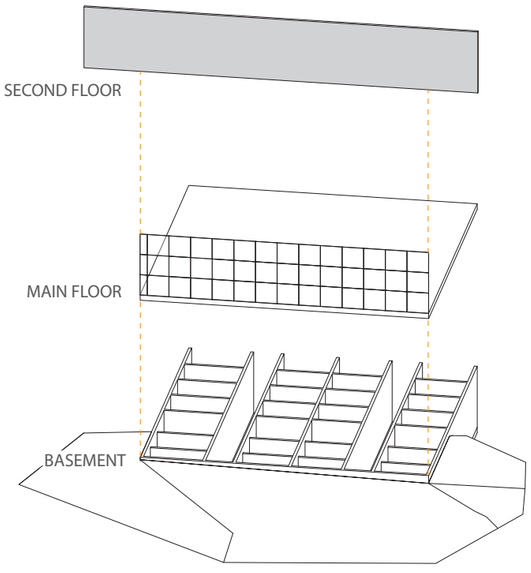
During preliminary discussions with the Steering Committee and Student stakeholder groups the following priorities were expressed:

- Expansion of student lounge space and student group space in the lower level.

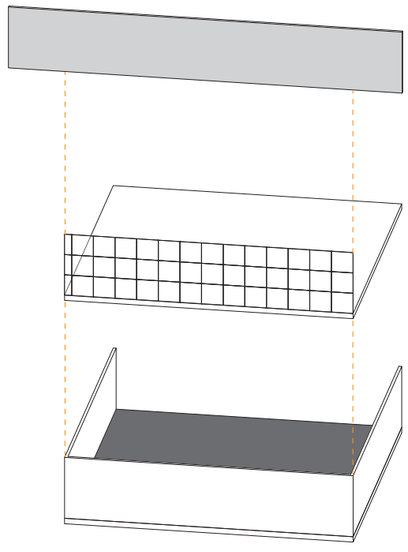
- Redevelopment of the lower level to make it a more attractive space that would engage students and foster a greater sense of student involvement. Natural light, connectivity to the Main Floor, visual exposure and direct access to 89th Avenue were seen as key factors to successfully animating the lower level space.

Preliminary Design

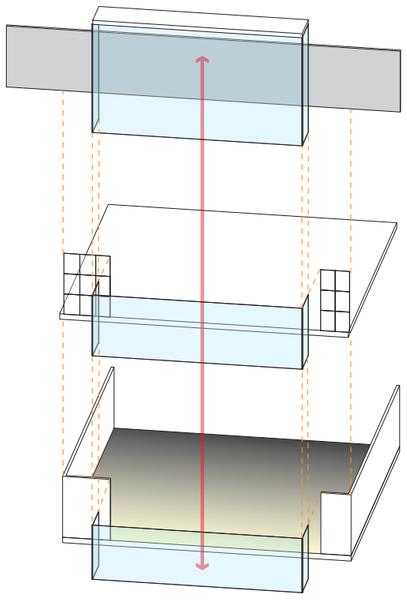
DIALOG proposed the addition of a glazed atrium to the south side of the Students Union Building. The atrium is located between mechanical service spaces and extends 42 metres from east to west and is 4.5 metres wide. Both the Main Floor and the Lower Level open onto this atrium to provide a visual connection between the floors. On the Main Floor, the exterior glazing is replaced with a glazed handrail. On the lower level portions of the exterior foundation wall between the structural columns are removed to open this level to the Atrium. At the atrium, the Main Floor assembly is sculpted to reduce its apparent thickness when seen from the atrium and 89th Ave. Beside the main entrance, a spiral stair provides direct access between the floors.



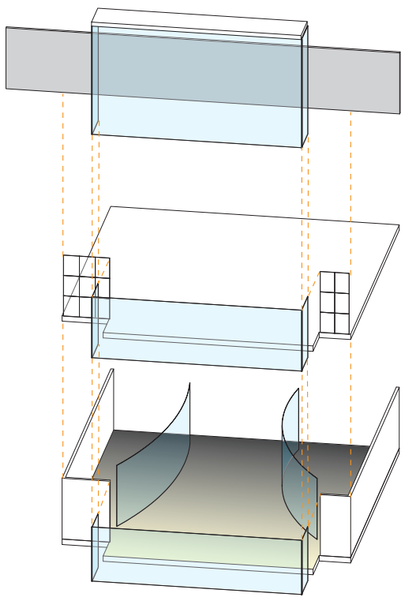
EXISTING BUILDING CONDITIONS



- EXCAVATE SOIL IN FRONT OF BASEMENT
- REMOVE EXISTING PARTITIONS



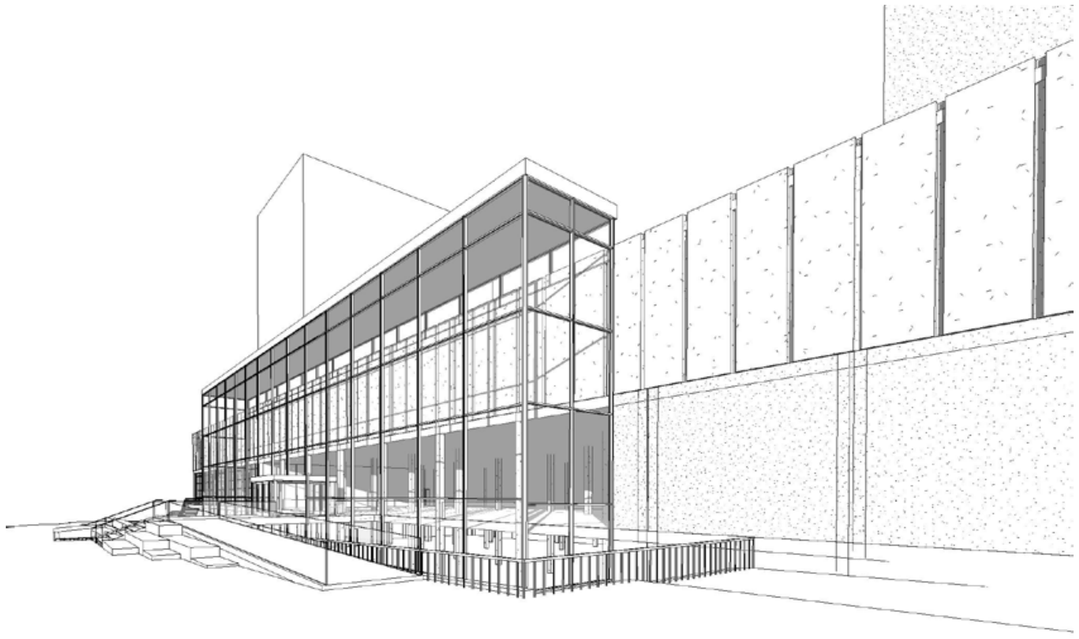
- REMOVE EXTERIOR WALLS
- ADD 3 STOREY GLASS BOX
- CIRCULATION BETWEEN BASEMENT + SECOND FLOORS

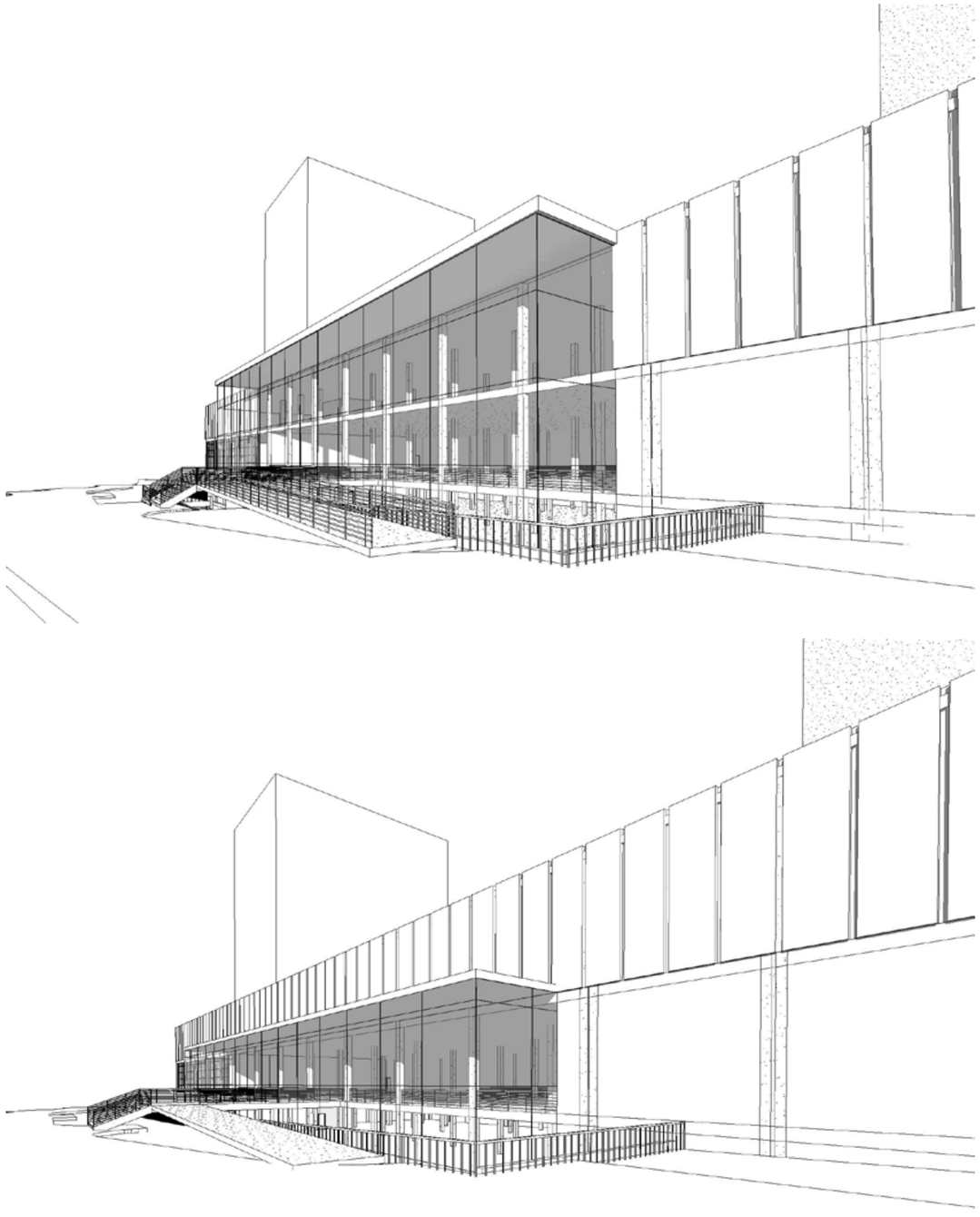


- ADD TRANSPARENT BASEMENT PARTITIONS

Atrium Options

Three options were considered for the height of the atrium, a single storey addition; a two storey addition aligning with the existing parapet height; and a two storey addition that extends approximately 2 metres higher than the existing parapet. The third option was selected to minimize the impact on the building's original Modern Architectural character especially when viewed from within. It also acts as a solar chimney in the summer to reduce the cooling load during the summer months. Triple glazed spider glass is proposed for the glazed atrium.





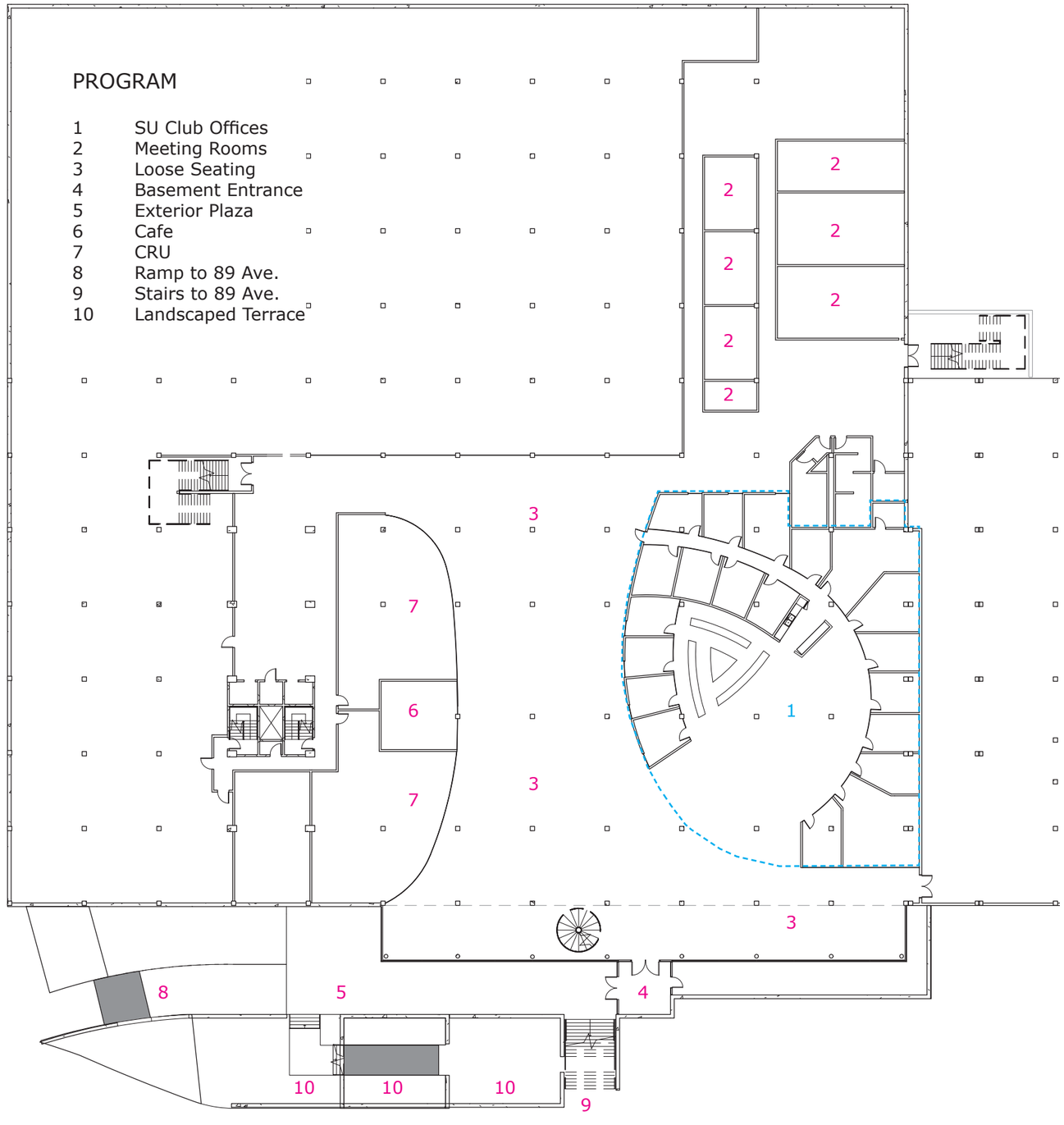
EXPLORED MASSING

Plan Development

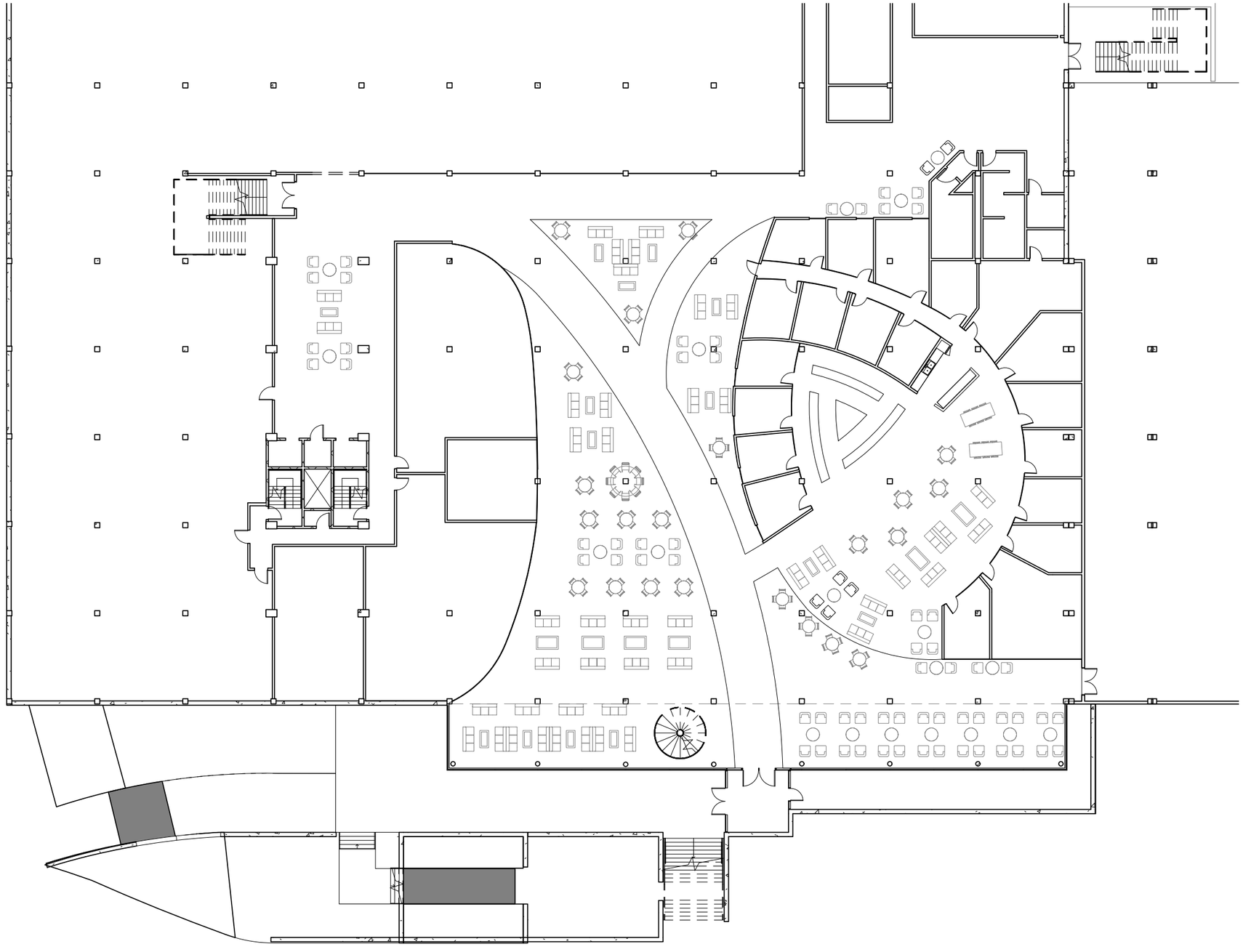
A landscaped forecourt is provided along the perimeter of the atrium. This forecourt allows for direct access from 89th Avenue to the Lower Level, improves its visibility from the street and improves daylight penetration into the lower level. West of the main entrance, where 89th Ave slopes downward, a series of landscaped terraces is provided to take advantage of this slope and soften the transition to the lower level. These terraces and the forecourt provide outdoor student social and gathering space. We understand that the development of the forecourt and its extent into 89th Ave is subject to further review by the University of Alberta.

The Lower Floor is developed to accommodate service and retail functions. A summary schedule of accommodation developed by the Student' Union Steering Committee in conjunction with the stakeholder group, is provided on the accompanying drawing.

Functions within the lower level are organized around a "T" shaped circulation pattern established by the Lower Level exterior entrance and the two primary stairs on the east and west side of the building. The area occupied by the existing bookstore is reduced in area and shifted to the north to provide for a larger student area and simplified circulation. A large student lounge is located on the centre circulation space and extends into the atrium to create a highly visible animated, and vibrant environment. This space is flanked by student group spaces and service offices on the east and student-oriented retail spaces on the west.



PROPOSED BASEMENT PLAN 1:400



PROPOSED BASEMENT PLAN 1:300

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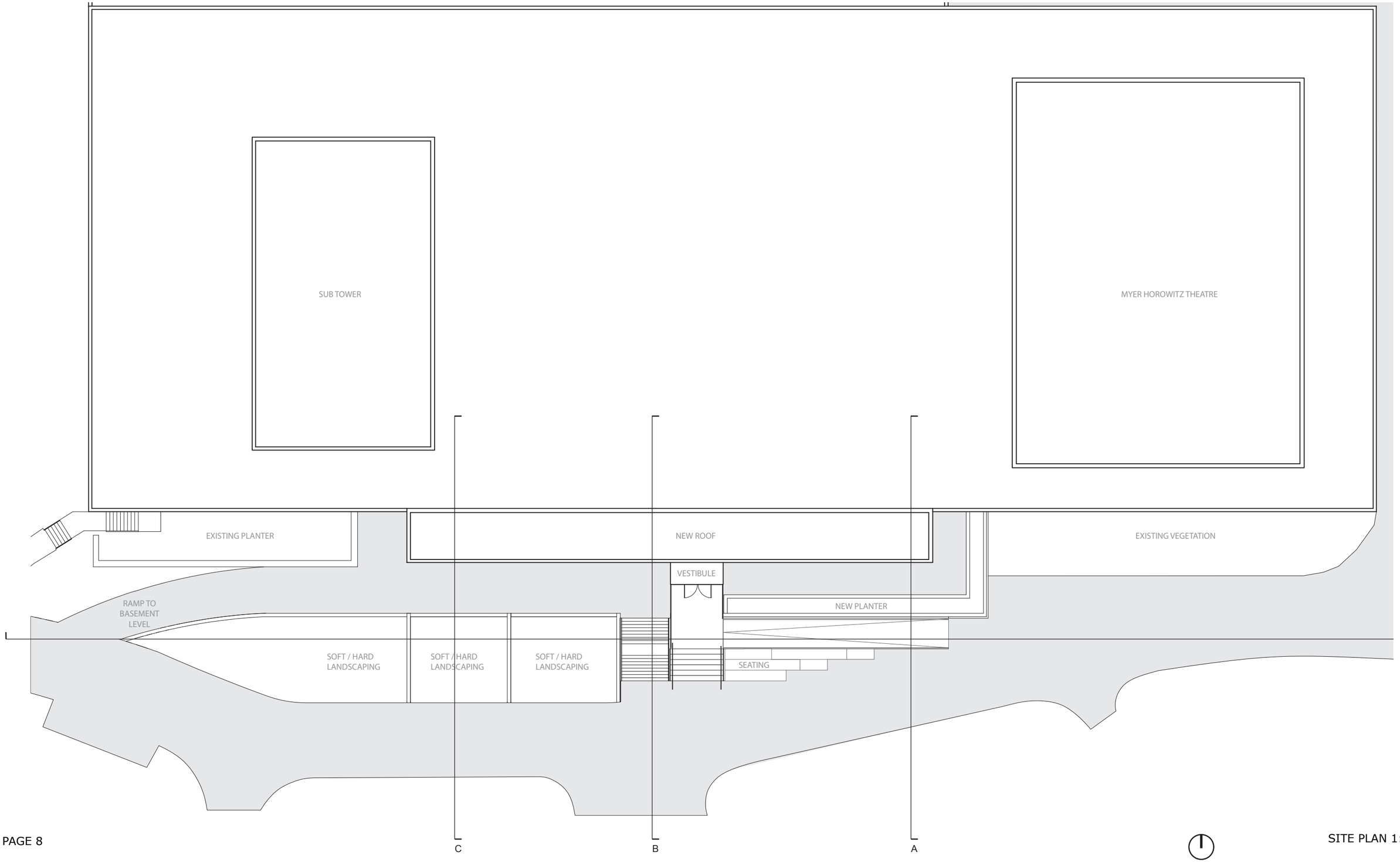
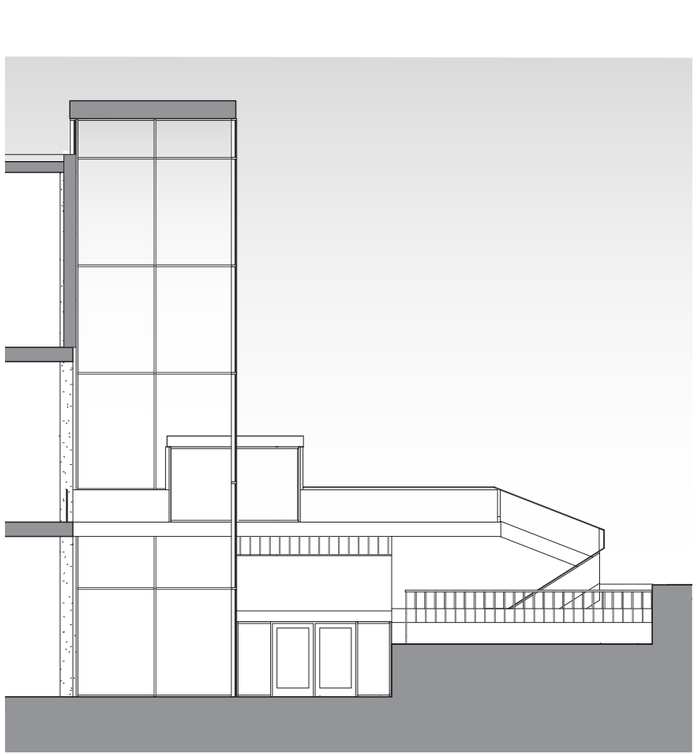
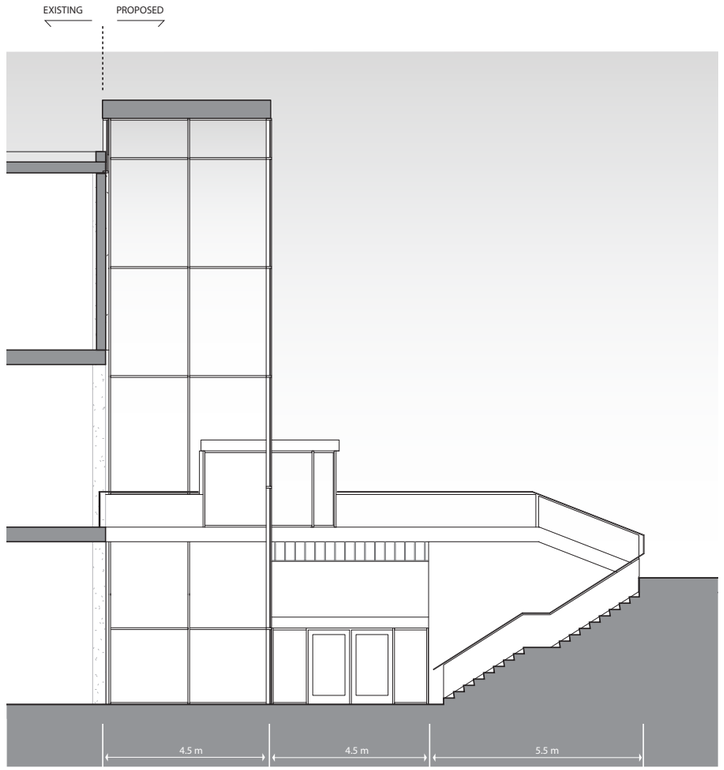


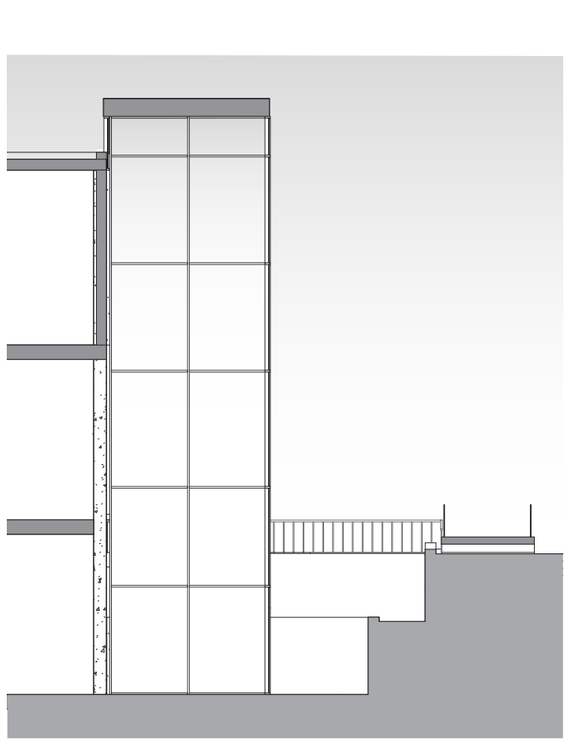
SITE PLAN 1:500



SECTION C



SECTION B



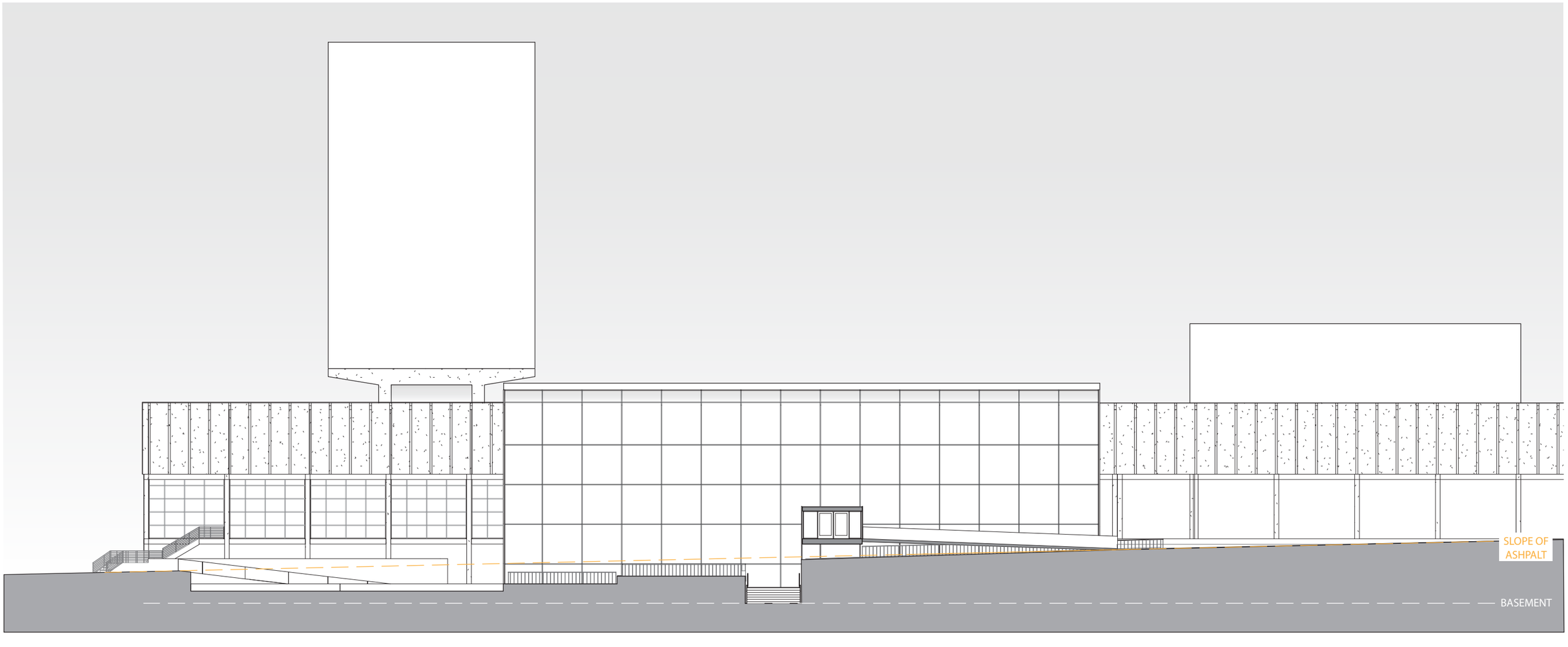
SECTION A

Building Code Review

The purpose of this building code review is to determine what additional measures, if any must be taken to accommodate the proposed design within the existing building. This review is based on the understanding that the renovations undertaken in 1993 and 2002 significantly upgraded the fire and life safety measures. In those renovations, a new exit stair compliant to current standards was added to the east side of the facility. The existing open stair, north of the existing elevator core, that serves the Lower Level, Main and Second Floors was separated from the remainder of the floor areas it serves and an exit corridor to the exterior was established.

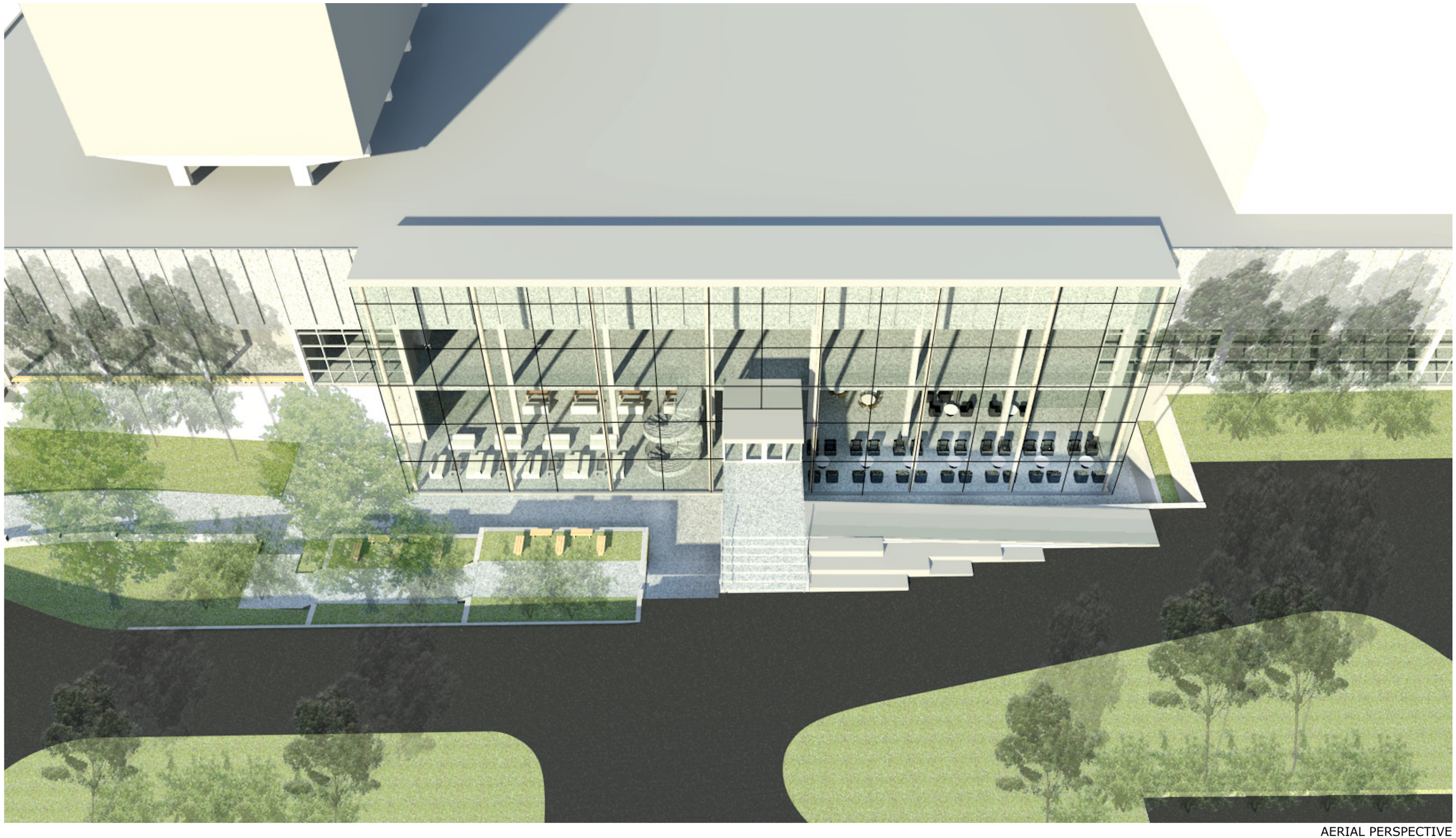
When the existing light wells were roofed over in 2002 what had been an exterior area became interior space. These spaces are now classified as interconnected floor spaces under the terms of the building code. Interconnected floor spaces that only connect two floors do not require any onerous measures, particularly as the existing glass windows provides for a smoke separation.

With this design, however, three floors become interconnected: the Lower Floor, the Main Floor and the Second Floor. Three storey interconnected floors require more stringent and costly measures including: mechanically vented smoke control systems, the creation of areas of protection or additional exists from all floor areas.
In the case of the Students' Union building the least costly approach is to provide new sprinkler lines with individual sprinkler heads at each second floor window in the existing light wells. The Authority having Jurisdiction may accept the introduction of the sprinklers along or may require that the existing aluminum windows be replaced with new windows in fire rated steel frames. With this approach, only the lower two floors would be classified as interconnected, thereby avoiding the stringent requirements.



SECTION 1

NORTH-EAST PERSPECTIVE



AERIAL PERSPECTIVE

NORTH PERSPECTIVE

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BASEMENT PERSPECTIVE
NORTH VIEW FROM EXTERIOR ENTRANCE

BASEMENT PERSPECTIVE
SOUTH VIEW FROM BOOKSTORE

BASEMENT PERSPECTIVE
SOFT SEATING BEHIND CURTAIN WALL

BASEMENT PERSPECTIVE
SU CLUB LOOSE SEATING

PROJECT BUDGET

An order of magnitude construction cost estimate developed by Turner and Townsend is based on the preliminary design concepts and engineering systems developed by DIALOG. These concepts were communicated through the exchange of drawing materials, outline specifications and information gathered in team meetings.

A detailed breakdown and description of the costs included can be found in Appendix A in the form of Turner & Townsend's cost report. The project soft costs were arrived at based on input from the Project Management consultant, Russell Steffes based on historical data and experience.

Substantial contingencies are included to cover risks that may be experienced by way of market escalation, hazardous material discovery during demolition, soil contamination or concealed conditions that cannot otherwise be discovered without invasive inspections and testing. Based on the information gathered to date, we believe these contingencies should be adequate.

ORDER OF MAGNITUDE PROJECT BUDGET SUMMARY

CONSTRUCTION ESTIMATE (Turner & Townsend Report)	$7,065,000
VESTIBULE ALLOWANCE (Turner & Townsend Report)	$65,000
SPIRAL STAIR ALLOWANCE	$75,000
DESIGN ALLOWANCE (Turner & Townsend Report)	$707,000
ESCALATION ALLOWANCE (Turner & Townsend Report)	$141,000
HAZMAT ABATEMENT ALLOWANCE	$150,000
CONSTRUCTION CONTINGENCY (Turner & Townsend Report)	$353,000
TOTAL CONSTRUCTION COST	**$8,556,000**
FF&E (FURNISHINGS, FIXTURES, EQUIPMENT)	$370,000
AUDIO/VISUAL EQUIPMENT	$125,000
SIGNAGE AND GRAPHICS	$35,000
SOLAR CONTROL BLINDS	$125,000
DESIGN CONSULTANT FEES	$761,280
PROJECT MANAGEMENT FEES	$368,335
TOTAL PROJECT COST	**$10,340,615**

SUB – Renovation and Expansion Concept
Systems Review – Structural
8 December 2011

STRUCTURAL SYSTEMS

Introduction / Scope

This report is prepared as part of the feasibility and cost study for the proposed refurbishment and expansion of the Student Union Building at the U of A. The scope of this report is to comment on the feasibility of the architectural intent for the expansion and to provide input on the options for structural systems required to realize this intent. This report is based solely on the latest architectural drawings and renderings of the proposed expansion and on record base building structural drawings prepared by B. W. Brooker Engineering Ltd., dated September, 1965. No inspections of the existing building have been performed. Information on subsequent refurbishments and renovations is limited but has been reviewed where available.

Notably, refurbishment structural drawings prepared by Read Jones Christofferson Ltd. dated September, 2001 have been reviewed. Main floor infill works between grids B and F have been noted. It is anticipated that these infill areas will have no impact on the structural modifications envisaged for the proposed expansion.

The proposed addition at the south end of the existing building involves demolition and alteration of the existing structural systems along this face. Strengthening works are required to the existing concrete framing to accommodate the proposed openings and additional imposed loads. The addition structure will consist of a 3-storey high clear-span steel frame supporting a light-weight steel deck roof. An approximately 4m high retaining wall is required along the site boundary at the south side to accommodate proposed grading.

Existing Building Structural Systems

The existing building consists of a 2 storey concrete frame on a single level basement. The framing system at the main, second and roof levels consist primarily of concrete joists spanning between concrete girders. The girders are supported by concrete columns and, in less frequent cases, by concrete shear walls and foundation walls. Building columns are typically on a 6.1m x 6.1m grid and are supported by concrete piles below basement level. Foundation walls are also supported on concrete piles. It is not clear from the drawings what type of concrete pile construction was used. The basement floor consists of a concrete slab on grade of varying thicknesses ranging from 125mm to 150mm.

Stability for the building is provided by the concrete shear walls which typically form stair and elevator core walls for the building. Perimeter foundation walls could also form part of this system which will need to be investigated as the design progresses.

Foundations and Basement Level Alterations

The proposed addition provides an expansion to the existing basement level and requires the removal of the existing foundation wall. Strengthening of the existing wall will be required above the new openings to create a beam along this edge. Strengthening will likely be in the form of steel plates or channels bolted through the existing concrete wall above the new opening locations. Retained beams will be in the order of 600mm - 750mm deep. Superficial cracking may result from this change of structural systems however these cracks will be an aesthetic issue and not structural.

350mm x 350mm pilasters are currently located from basement to main level below the perimeter building columns on the south face and will be retained to transfer the loads down to the piled foundations. Due to the removal of the restraint previously provided by the foundation wall and due to the increased load to these pilasters, strengthening of these columns may be required. Steel plates or channels are again anticipated as the method of column strengthening if deemed required. It is expected that the existing foundations will see no significant increase in load as a result of the proposed addition.

Based on previous experience with buildings near the proposed site, the foundation system for the steel columns and perimeter grade beams of the addition is envisaged as belled concrete piles. A geotechnical investigation and report will be required to confirm the ground conditions and give recommendations regarding foundations and retaining structures.

Barring any unforeseen conditions from the geotechnical investigation, the basement floor in the new atrium space will be a 125mm thick slab on grade that will tie into the existing building. It is anticipated that the existing slab on grade will be broken out locally to facilitate demolition of the foundation wall, and reinstated as part of the new slab.

Superstructure

The superstructure for the addition will consist of steel columns spanning 3 storeys supporting a lightweight roof system. Due to the long un-supported height of the new steel columns, a robust section will be required to resist the gravity and wind loads on these columns. A non-exhaustive list of options for these columns include:

- Steel Column: A wide flange section or hollow structural section (circular, square or rectangular). This option will likely required a 350mm-400mm deep section for the anticipated spans.

- Steel Truss Column: A steel truss column constructed with smaller steel wide flange or hollow sections. This type of column will yield smaller individual section sizes and provide a more transparent and potentially more aesthetically pleasing column. Various web steel arrangements are also possible (vierendeel, warren etc.). Although steel tonnage is likely reduced with this option, fabrication costs are greatly increased. This option will likely require a 750mm - 900mm depth.

- Bow-String Truss Column: A bow string truss column would consist of a steel column (wide flange or hollow section) reinforced with a tensioned cable chord. Costs associated with fabrication and erection for these trusses will be quite high. This option will likely require a 750mm - 900mm depth, with a front column depth of 250mm - 300mm.

Horizontal steel beam braces at either the main or second floor level tying the steel columns back to the existing structure could help reduce the effective length, and therefore depth, of the columns. This option, however, would impede the open space and may not be desirable architecturally.

A girt system will be required to span between the steel columns to provide support to the glass wall. The extent and size of these girt members will depend on the span capacity of the glass system. A preliminary section size based on a 9m column spacing yields roughly a 250mm deep hollow rectangular section.

The roof structure is anticipated as a lightweight steel deck roof supported by wide flange members. A likely overall "structural depth" at this level is in the order of 250mm to 300mm. The steel deck will act as a diaphragm and form part of the lateral load resisting system for the addition.

The link between the main floor and the road at the south of the building is planned as a bridge structure spanning approximately 9m over the basement level and through the glass facade. The structure is anticipated as concrete on steel deck floor supported by wide flange steel beams. The overall structural depth will be approximately 500mm.

The lateral stability of the addition will ultimately be provided by the existing lateral load resisting system. Localised loads from the addition will be transferred to the existing structure via concentrically braced frames and sway frames. The type and extent of these frames will depend on the selected column type, architectural constraints, and a more thorough assessment of the existing structural system.

Landscaping - Retaining Walls

In order to accommodate the final grading arrangement at the site, retaining walls are required along the south perimeter of the building. These retaining walls will effectively replace the existing foundation walls in separating the road grade from the basement level. Depending on the geotechnical recommendations, soil conditions, and wall location with respect to the site boundary, various retaining system options are available.

A traditional concrete retaining wall system would consist of a vertical reinforced concrete wall designed to cantilever from the base structure. The base structure would either consist of a continuous concrete "heel" embedded below the retained soil or, alternatively in this specific case, a toe formed as part of the courtyard slab spanning to the building perimeter columns. The latter option requires less excavation and is thus preferable. Wall thicknesses will likely vary from 300mm - 500mm at the base of the wall, depending on height of soil retained, which varies along the length. A requirement for piled foundations below this wall is likely, but is dependent on geotechnical recommendations.

An alternative system, space permitting, is to use soil stabilization behind the line of the retaining structure with horizontal reinforcement layers (commonly called reinforced earth retaining walls). This option requires a significant over-excavation behind the line of the retaining wall. Soil is then replaced between layers of horizontal reinforcement, e.g. steel mesh or woven "geotextile fabric, essentially anchoring the soil using its own mass. The wall can then be faced with a concrete panel, brick or other non-loadbearing cladding system.

SUB – Renovation and Expansion Concept
Conceptual Design Report – Mechanical
8 December 2011

MECHANICAL SYSTEMS

Summary

This section outlines the Mechanical Design for the new U of A Students' Union Building (SUB). Estimates of mechanical systems have been based on preliminary architectural layouts of the new atrium and revised basement areas. System capacities will be finalized with detailed heating and cooling load calculations through the design development phase and in conjunction with the details of the atrium envelope construction to be developed by the architectural team.

This review is based on a visual walkthrough on October 2, 2011 and on November 4, 2011, as well as discussions with University of Alberta operation and maintenance staff.

1.1.1 Code and Code-Referenced Standards

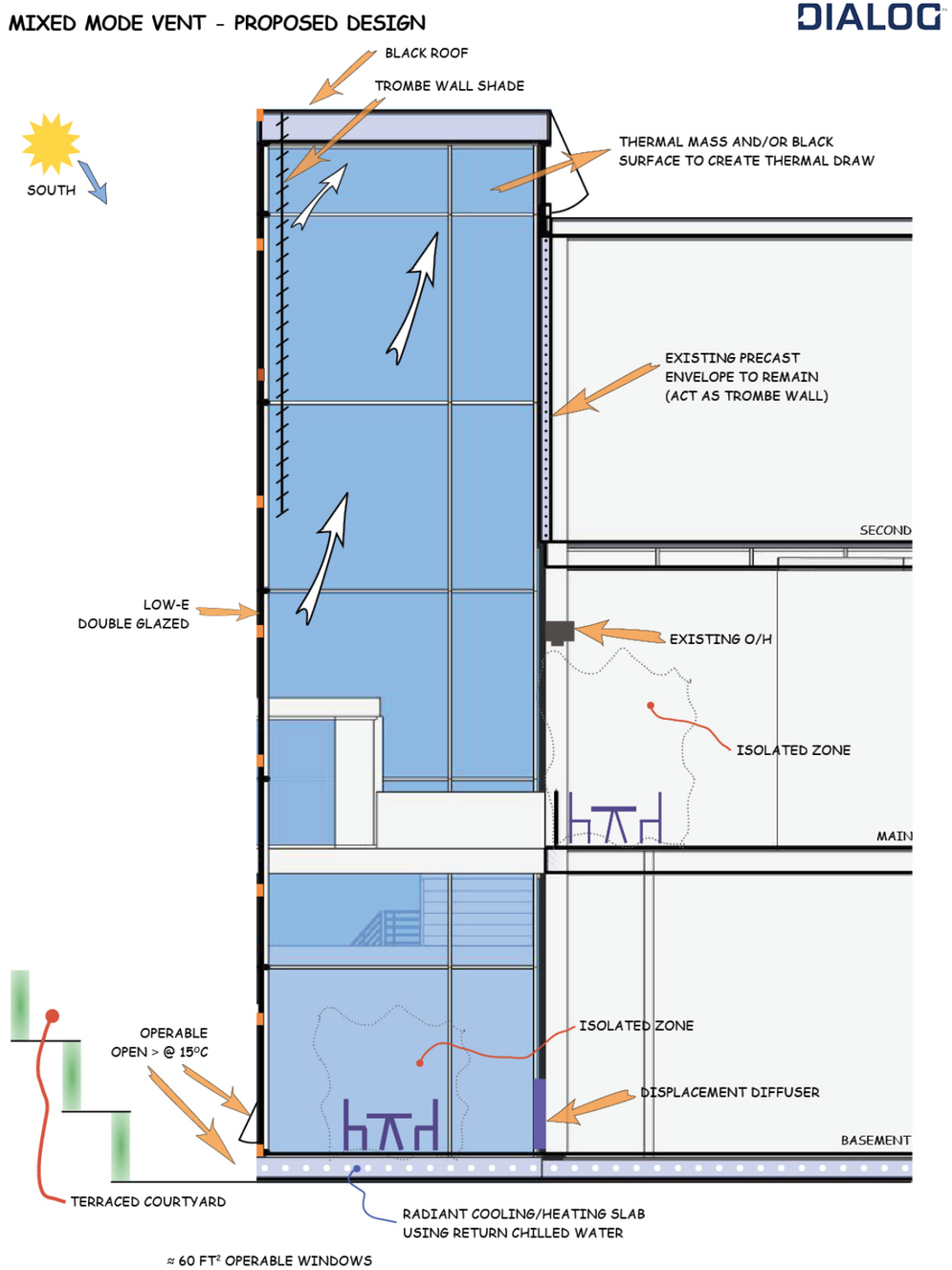
The following are applicable codes, and standards that are referenced by those codes. The requirements of these codes and standards will be met by the mechanical design.

- Alberta Building Code – 2006
- Alberta Fire Code – 2006
- ANSI/ASHRAE 62.1- 2010; Ventilation for Acceptable Indoor Air Quality
- NFPA 10-07; Standard for Portable Fire Extinguishers
- NFPA 13-07; Standard for the Installation of Sprinkler Systems
- NFPA 14-03; Standard for the Installation of Standpipe and Hose Systems

Standards and Guidelines

The following publications are accepted standards and guidelines of good engineering practice. These recommendations contained in these standards will generally be adhered to in the mechanical design.

- ANSI/ASHRAE 55-1982 Thermal Environmental Conditions for Human Occupancy.



Design Criteria and Standards

Heating and cooling load calculations are based on the 2006 Alberta Building Code and ASHRAE Handbook of Fundamentals.

The design conditions for the spaces within the main floor and basement will be:

Winter: Outdoor Temp: -34°C DB; Elevation: 645 m
Indoor Temp: 20°C to 22°C DB
Indoor Humidity: 30% RH at –20°C or above
Indoor Humidity: 20% RH at temps lower than –20°C

Summer: Outdoor Temp: 28°C DB/19°C WB; Elevation: 645 m
Indoor Temp: 22°C to 24°C DB
Indoor Humidity: 50% RH

Outdoor Air: Outdoor air requirements for ventilation will be based on the most stringent requirements of ASHRAE 62.1 – 2010

The design conditions for the proposed Atrium will be:

Winter: Outdoor Temp: -34°C DB; Elevation: 645 m
Indoor Temp: 20°C to 22°C DB
Indoor Humidity: 30% RH at –20°C or above
Indoor Humidity: 20% RH at temps lower than –20°C

Summer: Outdoor Temp: 28°C DB/19°C WB; Elevation: 645 m
Indoor Temp: 23°C to 27°C DB
Indoor Humidity: 50% RH

Outdoor Air: Outdoor air requirements for ventilation will be based on the most stringent requirements of ASHRAE 62.1 – 2010

The atrium will be designed with a combination of natural ventilation, solar shading, and radiant cooling to achieve thermal comfort. Thermal comfort is dependent on more than just air temperature, since total air velocity and the radiant effect can provide equivalent thermal comfort, ie. a fan on a warm day, a gas fired radiant heater on a cold day. Therefore, a thermal comfort model will be completed to compare air velocity, air temperature, and mean radiant temperature to establish comfort conditions.

Plumbing Revisions

Domestic Water

Existing domestic water will be modified to suit revised plumbing fixture location in the revised basement layout.

Storm Drainage

The atrium addition will add to net roof area of the Students' Union Building. The intent is to shed rain water back to the existing roof, local roof drains and leaders will have to be verified for available capacity during the design phase. Storm drainage from the new well created by the atrium should be controlled by surface runoff to the existing lower grade.

It is assumed that the existing basement has weeping tile, new weeping tile will be extended around the new perimeter atrium.

Sanitary Drainage

Existing under-slab sanitary drainage will be modified to suit revised plumbing fixture locations in the revised basement layout.

Central Heating System

Primary Source

Existing steam to hot water heat exchangers provide hot water for radiation, force flows, and unit heaters. The level of this conceptual report did not verify if the existing heat exchangers have sufficient additional capacity, therefore an allowance should be provided for a new steam to hot water heat exchanger to serve the Atrium heating system.

Dual-circuit radiant panels are proposed above the seating areas along the main floor overlooking the atrium. These radiant panels will provide additional thermal comfort to offset the mean radiant effect of a large glazed area discussed below. These radiant panels will be connected to the existing heating piping along the main floor area, since part of the existing envelope will be displaced by the new Atrium.

Hot water radiant tubing is proposed for the new Atrium slab on grade at the basement level. This new system will require a dedicated mixing loop and pumping to provide a lower supply water temperature for the radiant floor. The new Atrium slab will also require below grade insulation to allow the radiant heating to operate efficiently. This radiant heating will provide a local comfort zone at the basement level and will greatly increase the comfort in the seating areas.

Trombe Wall

The proposed architectural Atrium retains part of the existing pre-cast envelope contained within the Atrium space. This pre-cast envelope is constructed of pre-cast concrete with significant thermal mass. Incorporation of this pre-cast element leads to its' use as a partial Trombe wall. A Trombe wall is designed to capture solar energy during the winter months by utilizing thermal mass heated by the sun. Solar shading is configured at the Trombe wall to shade the wall during the summer and allow winter sun to heat the wall during the winter. The solar energy captured is released gradually due to the thermal mass, reducing the energy use of the space.

The Trombe wall exists already, so the only requirement is provision of a summer/winter solar shade using either a fixed angle or operable shades.

Vestibule Heating

A local vestibule heater will be provided to offset infiltration heating loads through the new entry vestibule.

Heating Comfort Analysis

The University of Alberta's Student Union Building Atrium proposes the use of spider joints with minimum double-glazing low-e glazing. The use of triple-glazing is also being investigated from to reduce heat losses and to further increase thermal comfort. Triple glazing provides increased thermal resistance and most importantly a higher interior surface temperature.

A large area of glazing with relatively low thermal resistance (R-3.3 for a double-glazed atrium) results in a low mean radiant temperature as well as radiant temperature asymmetry during cold winter temperatures. The occupants will feel uncomfortable due to the cool glazing surface temperatures. Typically, the air temperature in the atrium will increase to compensate, resulting in additional energy use.

Studies have shown radiant floor heating systems may improve the thermal comfort by increasing the mean radiant temperature. In this report, this argument has been modelled using the IES Virtual Environment program, and the impact of radiant floor heating on occupants' thermal comfort is presented.

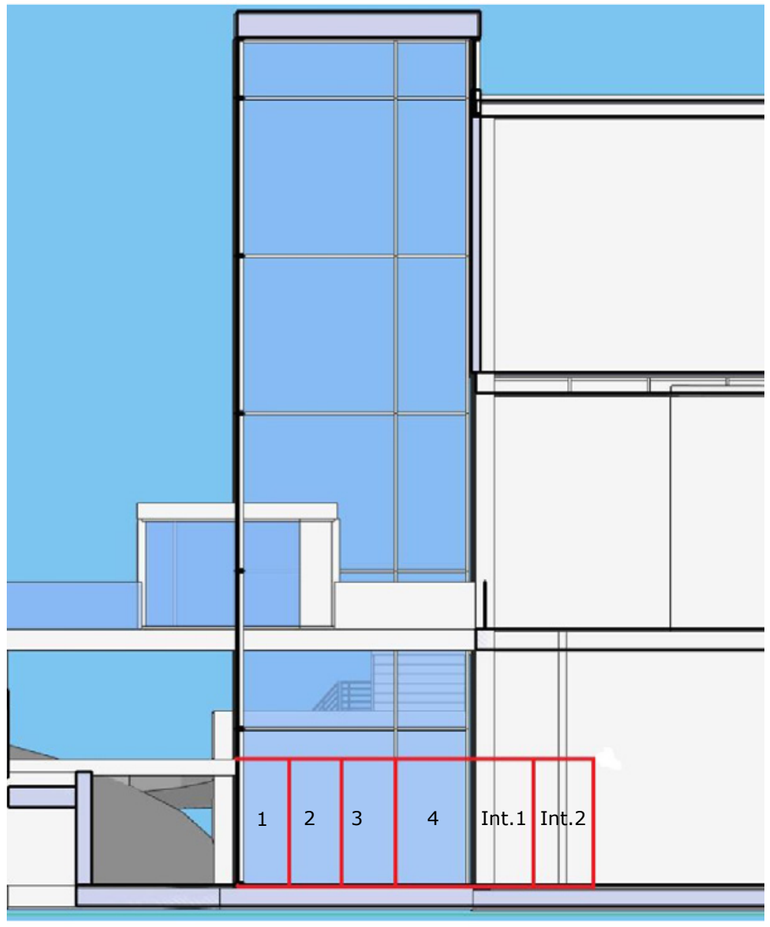


Figure 2: Schematic side view of the atrium and different zones

The bottom zone of the atrium is considered as the occupied space for comfort analysis (2 m high). This zone is divided into 4 sub-zones named 1 to 4 from left to right respectively (zone 1 being the space adjacent to the glazing). Zones 1 to 3 are each 1 m wide, and zone 4 is about 1.4 m wide.

The interior space next to the atrium is also included in the comfort analysis as it has a large view factor to the glazing area and the thermal comfort within this area might be affected by employing a radiant floor heating system. Interior zones 1 and 2 are each 1 m wide.

Results:
There are 6 main parameters affecting the thermal comfort: air temperature, relative humidity, clothing level, metabolic rate, air speed and mean radiant temperature. Thermal comfort is a qualitative factor; however, it is usually quantified and presented as Percent People Dissatisfied (PPD) that is a function of above-mentioned parameters. Based on ASHRAE standard 55, the design needs to provide the space with a comfortable indoor condition that keeps the PPD below 20%. Figure 2 shows the PPD in each zone in a typical winter day (Jan 4) without employing a radiant floor heating system.

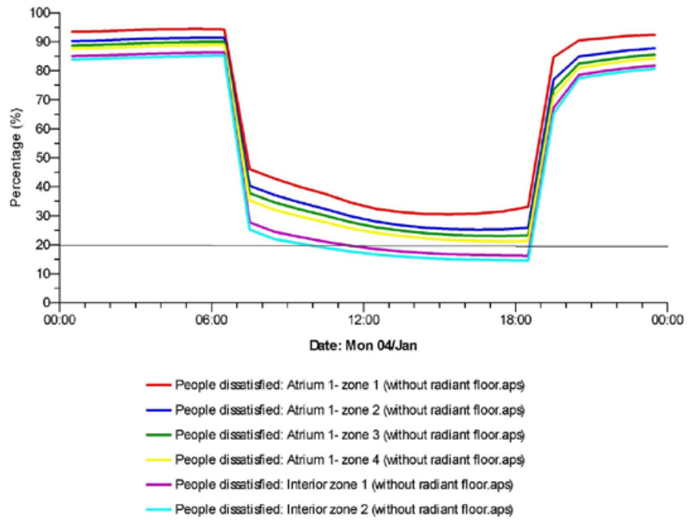


Figure 3: Percent People Dissatisfied (PPD) without radiant floor heating

As shown in Figure 3, the PPD level in the atrium space is above the 20% limit line for the entire day for a standard air temperature of 21°C. The interior zones fall below 20% PPD in afternoon hours when solar radiation heats up the glazing. On average, PPD in the atrium space is "uncomfortable" (above the standard limit) for 56% of occupied hours (7am-7pm, Mon-Fri) in January and February. As mentioned before, such thermal discomfort is mainly caused by low mean radiant temperature (MRT) in the space. Figure 4 shows the MRT in the atrium zones.

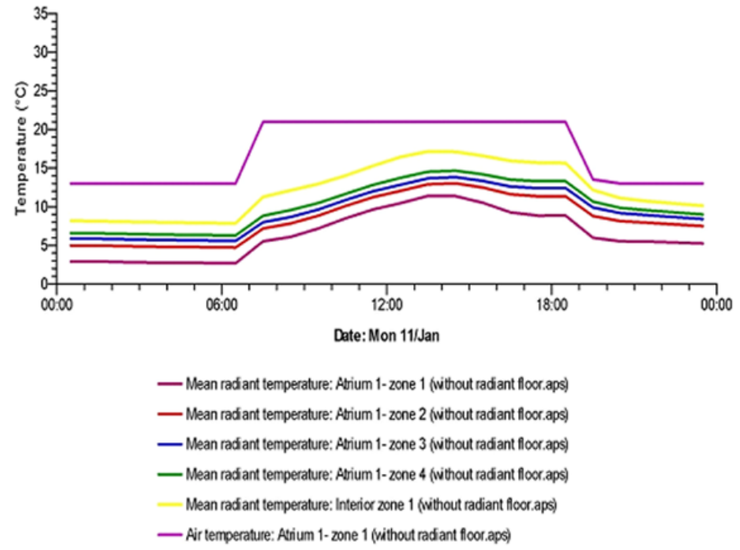


Figure 4: Mean Radiant Temperature (MRT) in the atrium space without radiant floor heating

As shown in the figure, the indoor temperature is maintained at 21°C during the occupied hours. However, the mean radiant temperature (that is weighted average temperature of all surrounding surfaces) is significantly lower than the room temperature due to the impact of a large-low surface temperature glazing area.

In order to increase mean radiant temperature (and consequently thermal comfort), a radiant floor heating system is proposed. The surface temperature is maintained at or below 29°C to meet both comfort requirements and loads. Figure 5 presents the IES results on PPD of the atrium when a radiant floor heating system is employed.

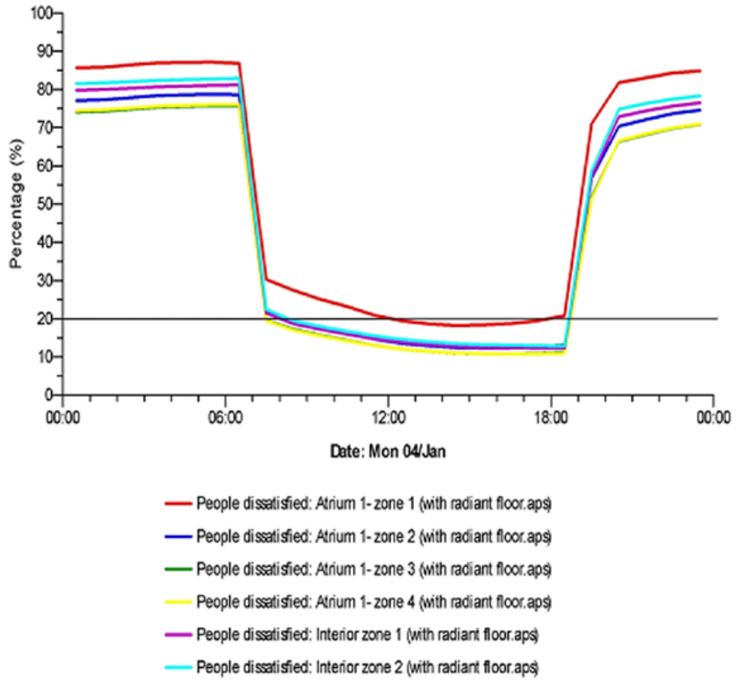


Figure 5: PPD with a radiant floor heating system

Comparing the results presented in Figure 5 against Figure 2, a significant impact of radiant floor heating on occupants' thermal comfort is observed. For the typical day of January 4th, the radiant system provides a comfortable space (PPD of below 20%) at all zones except for the morning hours at the zone very adjacent to the glazing (Zone 1). On average, PPD in the atrium space is above the standard limit for only 9% of the occupied hours (7am-7pm, Mon-Fri) in January and February (56% without radiant heating). Improved thermal comfort in the space is due to increased mean radiant temperature with the proposed radiant system (shown in Figure 6).

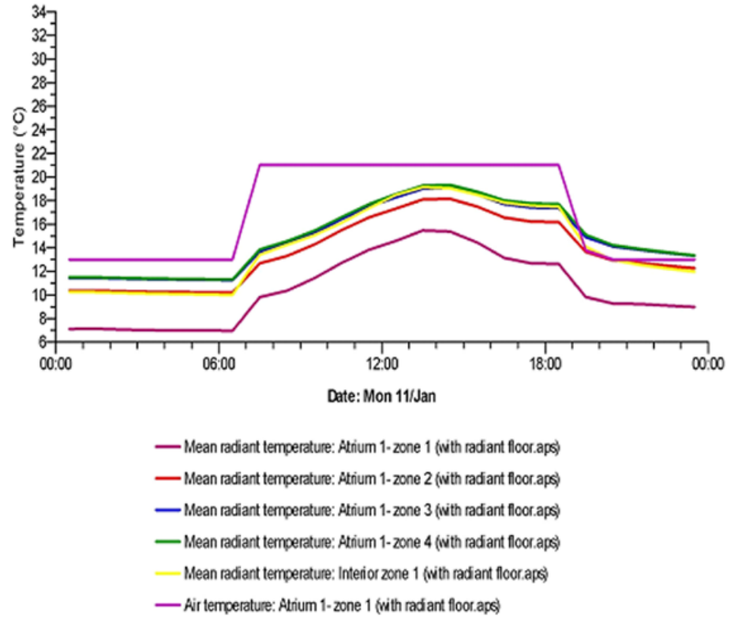


Figure 6: Mean radiant temperature with a radiant floor heating system

However the indoor air temperature is similar for the two studied cases, the space is considerably more comfortable with radiant floor heating. On average, the occupied section of the atrium and the interior zones (shown in Figure 2) are considered as "uncomfortable" for 56% of occupied hours in January and February without employing a radiant floor heating system. However, a radiant floor heating system provides comfortable condition for more than 90% of occupied hours in January and February.
In addition to improved thermal comfort, the floor heating system has the advantage of operating as a floor cooling system in summer. Radiant floor cooling systems have a very high performance in spaces where significant direct solar radiation strikes the floor (such as atriums).

Cooling System

Building Distribution

Chilled water for the U of A Students' Union Building (SUB) is supplied by the University of Alberta Central Plant. There is sufficient capacity in the chilled water system to accommodate the new loads.

It is intended that minimal cooling systems be added to support the new Atrium space. A new cooling loop connected to the existing return chilled water will supply the radiant slab (in cooling mode) and the dual circuit radiant panels. This chilled water supply will be controlled above dew-point temperature to prevent condensation. New pumps and a mixing station will be required to supply the warmer chilled water to these radiant elements. Using return chilled water for this service will also widen the temperature differential back to the University of Alberta cooling plant, which is desirable for load matching of chillers.

Chilled water will be supplied to the radiant floor slab through a switchover manifold that will switch from heating to cooling function in the summer. The radiant cooling slab will have substantial capacity where direct sunlight strikes the slab; this effect will be modelled by a daylighting analysis in future design. Chilled water will be supplied to the dual circuit radiant cooling panels in the summer, control offset will be provided to ensure simultaneous heating and cooling does not occur.

Ventilation System

Air Supply – General Description

The existing curling supply unit has sufficient air volume for the revised basement space layout including the expanded footprint of the Atrium. This unit has a capacity of approximately 10,800 l/s (23,000 cfm) which is adequate for the proposed load. The intent is to limit the additional air volume required to serve the Atrium by utilizing natural ventilation and radiant cooling panels. It is also intended that the proposed glazing has a shading coefficient in the 0.4 range while maintaining a visual transmittance of 70% or better. Solar control methods such as shading devices and fritting of the glazing, will also be explored to reduce solar heat gain. The outdoor air volume capability of the existing curling unit is also adequate for the proposed ventilation load.

Operable windows or motorized opening dampers will be provided at the low level at the courtyard and on the upper level of the Atrium. The Trombe wall shade will be configured to absorb solar energy near the top of the Atrium, which will assist in creating a natural thermal plume through the space. The radiant cooling will provide an isolated zone of comfort at areas adjacent to the Atrium.

The following is a description of the Natural Ventilation modelling performed for the proposed Atrium:

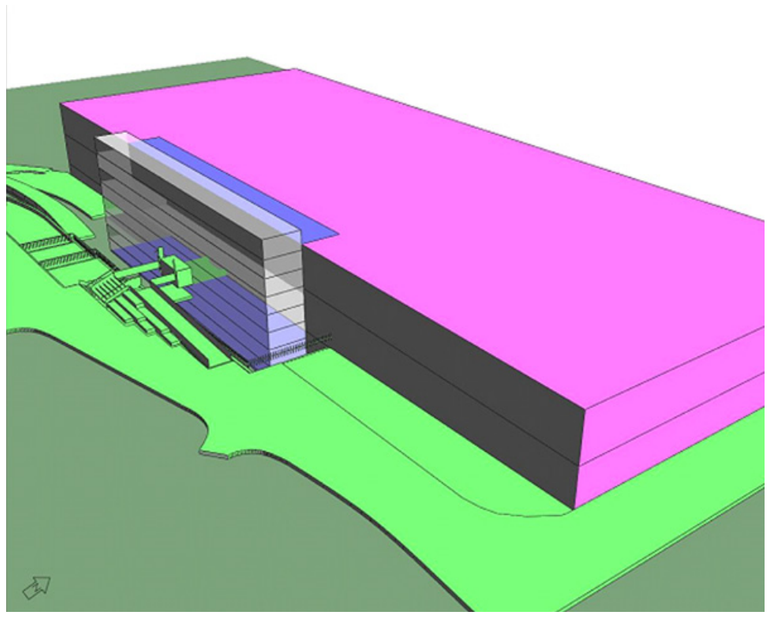


Figure 7: Natural Ventilation Model

Two openings are considered, one at the top (facing north) and the other one at the bottom of the atrium (facing south). The IES program is used to determine the impact of opening area on annual cooling energy use (Figure 8) and the variation of air temperature along a vertical plane in the atrium (Figure 9).

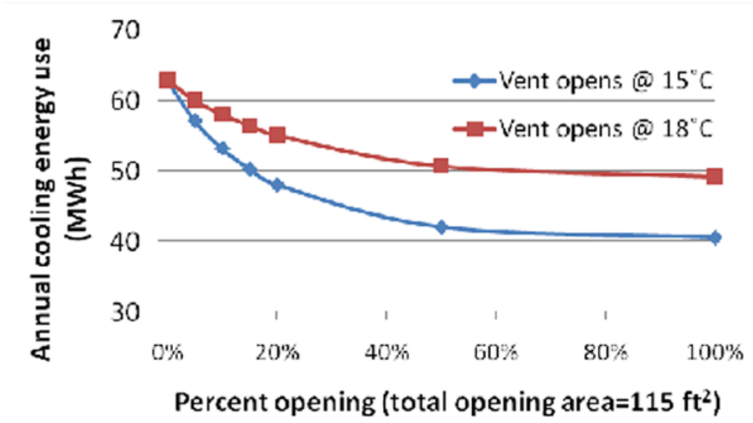


Figure 8: Impact of the opening area on annual cooling energy use

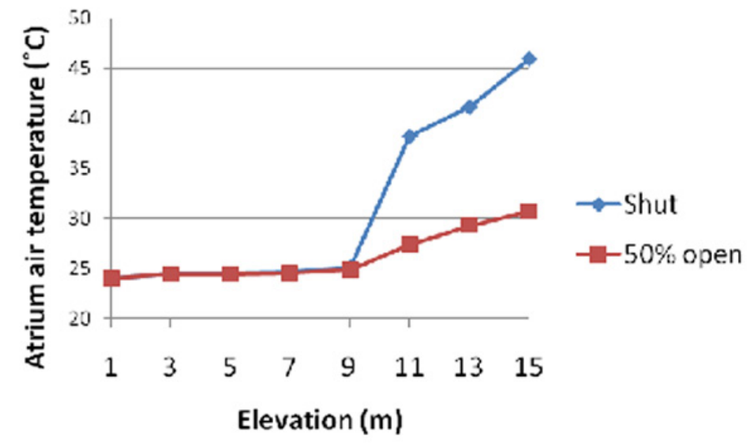


Figure 9: Air temperature profile along a vertical plane in the atrium (outdoor temperature at 28.3˚C on August 9 at 5 pm)

Figure 9 shows the peak cooling load breakdown by space. It should be noted that the building is occupied from 7am till 7 pm, Monday to Saturday with 10 W/m2 lighting load, 10 W/m2 equipment load and 10 people/100 m2. Infiltration rate is assumed to be 0.3 ACH..

Figure 10: Peak cooling load breakdown by vertical area of Atrium numbers in kW (total cooling load: 103 kW)

It is also intended to supply ventilation air from the existing air handling unit through displacement diffusers located along the new Atrium basement space. Warmer air will be supplied at approximately 17-18°C along the occupied area to provide ventilation by displacement. A fan powered box or fan coil will mix cooler primary air with return air from the space to provide warmer air. This displacement air will provide primary ventilation for the space when natural ventilation is not operable. The displacement air will be shut-off when in natural ventilation mode.

Air Supply Equipment

The existing air handling unit previously serving the curling rink was recently upgraded with a new cooling coil in 2008. This unit is a simple built up unit with a steam heating coil, chilled water cooling coil, and roll filters. The system is currently a combination of variable volume and constant volume, with variable volume boxes installed but no variable volume capability on the supply fan.

It is recommended that the supply fan motor be replaced and retrofitted with a variable speed drive to provide true variable speed control. Currently the fan rides the fan curve when boxes throttle back, severely limiting energy savings opportunities. It is also recommended that the unit be refurbished during construction including possible fan replacement, new steam coil, new filter section, and possible air handling unit panel repair.

Humidification

Direct injection steam humidifiers are installed in the air handling unit, this will be retained.

Fire Protection and Life Safety Protection

Sprinkler coverage will be required at the top of the atrium, new sprinkler heads will be installed at high level. Sprinklers within the basement will be adjusted as required to suit the new layout.
Hand held extinguishers will be provided throughout in compliance with NFPA 10 and local authorities.
All ducts and piping passing through a fire separation will be provided with fire stopping in accordance with the building code. Any ducts passing through a fire-rated wall will provided with an approved fire damper.

Control Systems

General

An extension of direct digital control (DDC) building management and controls system (BMCS) will control and monitor all mechanical equipment and will provide zone HVAC control. It is intended that the existing air handling unit, the terminal boxes in the zone, and new radiant cooling and heating equipment be upgraded to DDC control.

Space temperature control will be provided through terminal controllers, electronic room temperature sensors, and electronic reheat and heating control valves.
Standalone remote control panels will operate and monitor major mechanical equipment.

All field devices including valve and damper actuators, room temperature controllers, and HVAC system and equipment control and monitoring devices will be electronic.

SUB – Renovation and Expansion Concept
Systems Review – Electrical
8 December 2011

ELECTRICAL SYSTEMS

Summary

This review assesses the capabilities of the existing electrical systems to facilitate the concept proposed to expand and renovate the Student Union Building on the University of Alberta Campus. The review covers power, communications (data, voice, audio/visual), fire alarm, security and lighting. It is based on visual walk-throughs on the 2nd of October 2011 and the 8th of November 2011 and a review of drawings.

Generally the electrical systems are in good condition; consistent with what is normally expected based on the equipment's age and type of facility.

Power

Normal Power

The Student Union Building receives its power through the utility corridor from a dual primary feed. There is a high voltage substation located within the basement of the facility, adjacent to the mechanical room, where the 13.8kV utility power is transformed
to 347/600V power for use within the building. The service is sized at 1500kVA. 600V to 120/208V transformers are located in local electrical rooms throughout the facility, with distribution panels within the same rooms. Some of the equipment was upgraded or replaced through previous renovations. Panels that are original to the building are typically fully utilized and at the end of their service life.

There is sufficient capacity within the system to handle the upgrades required for the proposed expansion and renovation. New branch panels are recommended for all service revisions and changes, since the local branch panels are fully utilized, with no
spares or spaces, and are typically original to the building. The new branch panels will be located in the existing mechanical/electrical room space, or in the existing transformer room behind the elevators.

Power distribution to new receptacles and equipment will be coordinated with through the design process.

Connections required for the new mechanical equipment will be determined through the design process. Since many of the CDPs were upgraded and replaced in the early 2000's, additional breakers will be added to the CDPs as required, and an MCC will be added for the new equipment.

Emergency Power

There is a small, 30kVA 208V emergency generator located within the mechanical room, serving the life safety needs of the Student Union Building, including emergency egress lighting and the fire alarm panel. The small number of additional emergency lighting required for the expansion should be able to be served through this generator, particularly due to the energy management upgrade done in 2009/2010 which reduced the power draw of all of the lighting, including emergency lighting, in the facility.

Normal power on the campus utility is a reliable power supply. The U of A utilities department has not recorded an outage of longer than two minutes for the past 3 years, and they have a robust maintenance program that is designed to reduce frequency and
duration of outages. As such, the probability of losing normal power is low, and the generator is considered sufficient for the existing building and proposed expansion. No mechanical equipment will be added to the emergency power system.

Lighting

The lighting in the Student Union Building is typically 347V, operated with low voltage lighting controls through local switching. The lighting fixtures are typically original to the building, but they were upgraded for energy efficiency in 2009/2010, using T8 linear
fluorescent lamps with instant start ballasts. There is a mixture of fixture types, suited to the spaces, including multi-lamp round fixtures in the bookstore area, and 1'X4' fixtures in other areas. Some new fixtures were added in the 2009/2010 lighting upgrade, as well, utilizing T8 fluorescent lamps with instant start ballasts, or compact fluorescent lamps, depending on the fixture type.

This proposed renovation is typically in areas where the original fixtures were relamped and reballasted. As such, new fixtures will be required to suit the new space. New fixtures will also be required in the expansion area.

Lighting will be designed to suit the space, and will consist of pendant fixtures with ceramic metal halide or fluorescent lamping, linear fluorescent fixtures, indirect ceramic metal halide fixtures and/or LED fixtures, as appropriate. Lighting will be added to the
low voltage lighting control system, through a new low voltage relay panel tied to the overall system.
In areas with intermittent occupancy, vacancy sensors will be installed to turn the lighting off when the space is unoccupied. The sensors will be designed for manual on/automatic off operation.

Day Lighting

The expansion to the facility will enable the expansion to be fully day-lit, along with a portion of the renovation. Glare control may be required, depending on the uses of the space. Providing there are no other obstructions, it is expected that a zone up to 8m deep into the floor space will be day-lit, in addition to the new atrium. This brings daylight in past the first row of columns.

To facilitate day lighting and reduce electric lighting power consumption, photosensors will be installed to turn lights on and off as appropriate, and dimming ballasts will be used where dimming is more appropriate than on/off sequencing.

Low Tension Systems

Fire Alarm System

The existing fire alarm system for the Student Union Building is a Notifier system employing pull stations, sprinkler monitoring devices, fire detectors and audible and visual signaling devices, and is suitable for the building expansion. The system consists of a control panel located in the main mechanical room, with annunciator panels at the fire fighter entrances, complete with phones to call the University Control Centre.

The fire alarm syste m is able to be expanded into the expansion area, and reconfigured to suit the new arrangements. The main panel locations will remain unchanged.

Security System

CCTV, access control and other security measures will need to be designed for the specifics of the open access environment with U of A security. Cameras may desired for specific areas.

Data and Telephone

The existing data closet is located between the elevators, on a rack mounted above head height. A proper analysis of the data and telephone cables was unable to be completed, due to this location, and it is beyond the scope of this review to confirm end-to-end integrity of the cabling. Data and telephone will be expanded and relocated to suit the expansion and renovation. Due to the location of the existing data closet, it would be appropriate to locate a new data closet within the expansion and renovation area.

Figure 1 – Sketch of Approximate Daylight Zone (in Elevation)

Appendix A
Cost Report

Turner & Townsend

Report
On
Order of Magnitude Construction Costs

UNIVERSITY OF ALBERTA

Students Union, Edmonton
For Students Union, University of Alberta

Turner & Townsend
10180-101 St
Suite 1150
Manulife Place
Edmonton
Alberta
T5J 3S4

t: +1 (780) 643 0134
e: brandon.billsten@turntown.com
w: turnerandtownsend.com

5th January 2012
ref no. 20179

Students Union, University of Alberta
C/O
Mr Russell Steffes
10558 – 115th Street
Edmonton
Alberta
T5H 3K6

For the attention of Mr Russell Steffes,

Dear Russell,

STUDENTS UNION, UNIVERSITY OF ALBERTA, EDMONTON, AB
ORDER OF MAGNITUDE COST ESTIMATE

We enclose our Order of Magnitude estimate for the above-noted project, based on the documentation provided to us, listed in Section 5 of this report.

Please refer to our Executive Summary, Section 1, for specific qualifications and assumptions associated with this cost report.

We trust this meets with your approval. Should you have any questions please do not hesitate to contact us.

Yours Sincerely

Mark Hutchinson
Director
Turner & Townsend
e: mark.hutchinson@turntown.com

cc.
Mr Brandon Billsten - Turner & Townsend

Contents

Rev	Originator	Approved	Date
0	Mark Hutchinson	Mark Hutchinson	5/January/2012

DOCUMENT1

For Students Union, University of Alberta
Students Union, Edmonton

1 EXECUTIVE SUMMARY

1.1 Introduction

Turner and Townsend is retained to provide an Order of Magnitude Estimate for Student Union, University of Alberta, Edmonton, including this report. The Estimate is for the "hard" Construction Cost component of the project only and does not include for any project soft costs.

1.2 Procurement and Schedule

The Construction Cost Estimate includes all direct construction costs and contractor's overhead and profit. It assumes the project will be procured on a **Stipulated Lump sum basis**, and that bids will be received from a minimum of five pre-qualified general/fit-out contractors. We also assume that the project will be completed in a reasonable time frame and have not included any premiums required for "fast-tracking" the project, working out-with regular hours or allowances for restricted construction access.

1.3 Risk Assessment

Post-Contract Contingency (i.e. for Change Orders which may arise during construction) has been included in our cost report.

1.4 Level of Documentation

The estimate is based on the drawings and information provided as listed in Section 5 of this report and supplemented by discussions with Dialog. It reflects current December 2011 rates and present market/local conditions.

The estimate includes an Estimating/Design Contingency Allowance to account for increases in cost as a result of design development through to 100% complete documentation.

1.5 Market Conditions

The estimate is based on normal competitive conditions and is intended to fall within a range of bids received from a number of competitive contractors. Adverse local and global market conditions, proprietary specifications, single-sourcing of materials and equipment, or lack of bidders may cause bids to vary from reasonable estimates based on normal competitive conditions.

Contingency is included in our estimate to allow for construction price escalation to the anticipated start date, which we have forecast as Summer 2012. We recommend this be reviewed prior to construction start.

1.6 Assumptions/Exclusions

Please refer to our detailed elemental back-up for specific assumptions.

1.7 Limitation of Scope

Turner & Townsend is not currently retained to prepare further Estimates/Cost Plans as design progresses. We do however, recommend further Cost Estimates are produced as the design evolves and the specifications are solidified to maintain budget certainty ahead of tendering. If we are retained beyond this Order of Magnitude estimate we can prepare detailed estimates at given design milestones (Design Development, Working Drawings and PreTender stages). In addition to further estimates we can also assist with Value Engineering and Life Cycle payback analysis should these be required.

For Students Union, University of Alberta
Students Union, Edmonton

Turner & Townsend

2 ESTIMATE SUMMARY

Estimate Summary of Students Union, University of Alberta, Edmonton Construction Costs

	Item	GFA (m²)	$/m²	Total Cost
1	Construction Costs	2,122	$3,329	$7,065,000
2	Estimating Allowance (Design Contingency)		10%	$707,000
3	Escalation Allowance		2%	$141,000
4	Construction Allowance (Change Orders)		5%	$353,000
5	**Estimate Total**	**2,122**	**$3,895**	**$8,266,000**
6	Cost Option – Allowance for Furniture			$370,000
7	Cost Option – Allowance for Entry Vestibule			$65,000

Qualifications:

1. The Cost Estimate includes all direct construction costs, contractors overhead and profit and assumes the project will be procured on a competitive basis with tenders received from not less than 5 contractors
2. We have included an Estimating Allowance which accounts for increases in costs as a result of the design development process.
3. The Cost Estimate is priced in current market conditions and reflects present market conditions with an Escalation adjustment of 2% to take pricing to Summer 2012.
4. Lack of tendering competition, proprietary specifications and lack of design information clarity can all lead to tenders varying from reasonable estimates based on normal competitive conditions.
5. Cost Option for Furniture above is indicative only at this time as further detailing needs to take place before accurate costing exercises can by conducted. The items making up the value are located in section B31 of our estimate noted as NIC.
6. Cost Option for the entry vestibule above is indicative only at this time as further detailing needs to take place before accurate costing exercise can by conducted.
7. We have assumed all the existing concrete retaining walls, grading and planting will be removed and replaced with new to suit the design.
8. We have assumed the new CRU and Café spaces will be shelled only (enclosing partitions, drywall ceiling and terminated services) with fit out by the commercial vendor.
9. We have assumed the concrete entrance stairs and suspended slab will be left in place.
10. We have excluded the Spiral stair shown in A108 as this conflicts with the scope of work parameters.
11. Assumed new atrium glazed elevation will be washed and maintained from ground level.
12. Main switchboard is adequate and no work is required
13. Emergency system is adequate and no work is required
14. Add new circuit breakers to existing normal and emergency distribution panels
15. New normal and emergency panels, transformers and feeders as required
16. Feeder and disconnect switch only to shell spaces
17. Wiring to Mechanical equipment as required
18. New energy efficient lighting throughout with central control, local switches and occupancy sensors
19. Local branch devices and power connections as required
20. Existing fire alarm system extended to suit
21. Existing security system extended to suit
22. Communications outlets and wiring to suit
23. Existing PA system extended to suit
24. Empty conduit only for Audio Visual system where indicated
25. Refer to our detailed estimate breakdown in Section 3 for further information.

Exclusions:

1. GST
2. Soft Cost (Professional Fees, Financing Costs, Permitting Costs, Development Costs, etc)
3. Removal of contaminated materials (including Asbestos in the building and hydrocarbons in the ground)
4. Premiums associated with Single Sourcing
5. Phasing Premiums
6. Signage and Graphics
7. Work to the CRU spaces and Kitchen Equipment costs
8. Flat Screen TV Equipment and Installation
9. Furnishing and Fittings beyond those specifically annotated in the Estimate
10. Blinds to the new glazed extension elevation
11. Working outwith normal working hours
12. Communication Active Hardware
13. Audio Visual Equipment, Devices and Wiring
14. Lightning Protection
15. Emergency back-up power

For Students Union, University of Alberta
Students Union, Edmonton

Turner & Townsend

making the **difference**

For Students Union, University of Alberta
Students Union, Edmonton

Turner & Townsend

3 ELEMENTAL COST SUMMARY

Turner & Townsend

ORDER OF MAGNITUDE ESTIMATE
Elemental Cost Summary

Project: University Of Alberta - Students Union
Location: Edmonton, AB
Owner/Client: University Of Alberta
Architect: DIALOG

Cat:
File: MAH-OoM-0
Date: Jan 5, 2012
Project Number: 20179
Gross Floor Area: 2,122 m2

Element	Ratio to GFA	Elemental Quantity	Elemental Unit Rate	Elemental Amount	Cost/m2	Amount	
A SHELL							
A1 SUBSTRUCTURE					**$96.61**		
A11 Foundation	1.00	2,122 m2	$43.83	$93,000	$43.83		
A12 Basement Excavation	0.90	1,915 m3	$58.49	$112,000	$52.78	**$205,000**	**2%**
A2 STRUCTURE					**$165.41**		
A21 Lowest Floor Construction	1.00	2,122 m2	$60.79	$129,000	$60.79		
A22 Upper Floor Construction	0.00	0 m2	$0.00	$0	$0.00		
A23 Roof Construction	1.00	2,122 m2	$104.62	$222,000	$104.62	**$351,000**	**4%**
A3 EXTERIOR ENCLOSURE					**$1,596.61**		
A31 Walls Below Grade	0.00	0 m2	$0.00	$0	$0.00		
A32 Walls Above Grade	0.00	0 m2	$0.00	$0	$0.00		
A33 Windows & Entrances	0.50	1,055 m2	$3,160.74	$3,333,000	$1,570.69		
A34 Roof Covering	0.12	256 m2	$214.84	$55,000	$25.92		
A35 Projections	0.00	0 m2	$0.00	$0	$0.00	**$3,388,000**	**41%**
B INTERIORS							
B1 PARTITIONS & DOORS					**$153.16**		
B11 Partitions	0.75	1,589 m2	$159.89	$254,000	$119.70		
B12 Doors	0.01	25 No	$2,840.00	$71,000	$33.46	**$325,000**	**4%**
B2 FINISHES					**$178.13**		
B21 Floor Finishes	1.00	2,122 m2	$91.89	$195,000	$91.89		
B22 Ceiling Finishes	1.00	2,122 m2	$68.33	$145,000	$68.33		
B23 Wall Finishes	1.25	2,642 m2	$14.38	$38,000	$17.91	**$378,000**	**5%**
B3 FITTINGS & EQUIPMENT					**$10.84**		
B31 Fittings & Fixtures	1.00	2,122 m2	$10.84	$23,000	$10.84		
B32 Equipment	0.00	0 m2	$0.00	$0	$0.00		
B33 Conveying Systems	0.00	0 stp	$0.00	$0	$0.00	**$23,000**	**0%**
C SERVICES							
C1 MECHANICAL					**$296.42**		
C11 Plumbing & Drainage	1.00	2,122 m2	$13.20	$28,000	$13.20		
C12 Fire Protection	1.00	2,122 m2	$28.75	$61,000	$28.75		
C13 H.V.A.C.	1.00	2,122 m2	$227.62	$483,000	$227.62		
C14 Controls	1.00	2,122 m2	$26.86	$57,000	$26.86	**$629,000**	**8%**
C2 ELECTRICAL					**$244.58**		
C21 Service & Distribution	1.00	2,122 m2	$59.85	$127,000	$59.85		
C22 Lighting, Devices & Heating	1.00	2,122 m2	$108.86	$231,000	$108.86		
C23 Systems & Ancillaries	1.00	2,122 m2	$75.87	$161,000	$75.87	**$519,000**	**6%**
NET BUILDING COST (Excluding Site)					$2,741.75	**$5,818,000**	**70%**
D SITE & ANCILLARY WORK							
D1 SITE WORK					**$139.49**		
D11 Site Development	0.40	850 m2	$309.41	$263,000	$123.94		
D12 Mechanical Site Services	0.40	850 m2	$23.53	$20,000	$9.43		
D13 Electrical Site Services	0.40	850 m2	$15.29	$13,000	$6.13	**$296,000**	**4%**
D2 ANCILLARY WORK					**$65.03**		
D21 Demolition	0.88	1,866 m2	$57.34	$107,000	$50.42		
D22 Alterations	1.00	2,122 m2	$14.61	$31,000	$14.61	**$138,000**	**2%**
NET BUILDING COST (Including Site)					$2,946.28	**$6,252,000**	
Z GENERAL REQUIREMENTS & ALLOWANCES							
Z1 GEN. REQ. & FEE	**13.0%**				**$383.13**		
Z11 General Requirements	10.0%			$625,000	$294.53		
Z12 Fee	3.0%			$188,000	$88.60	**$813,000**	**10%**
TOTAL CONSTRUCTION ESTIMATE (Excluding Allowances)						**$7,065,000**	**85%**
Z2 ALLOWANCES	**17.0%**				**$565.98**		
Z21 Estimating Allowance	10.0%			$707,000	$333.18		
Z22 Escalation Allowance	2.0%			$141,000	$66.45		
Z23 Construction Allowance	5.0%			$353,000	$166.35	**$1,201,000**	**15%**
GOOD & SERVICES TAX	0.0%	EXCLUDED		$0	$0.00	**$0**	**0%**
TOTAL CONSTRUCTION ESTIMATE (Including Allowances)						**$8,266,000**	**100%**

GFA	**2,122 m2**
Refurb	1,866 m2
New Build	256 m2

Cost/m2
$3,895

making the **difference**

Project: University Of Alberta - Students Union
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Architect: DIALOG

File: MAH-OoM-0
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Gross Floor Area: 2122 m2

Description	Trade	Quantity	Rate	Amount
A1 SUBSTRUCTURE				
A11 Foundations				
Exteral Wall Strip Footings (1000mm x 450mm)		55 m		
Concrete		25 m3	160.00	3,960
Formwork		25 m2	150.00	3,713
Reinforcement		2,351 kg	1.50	3,527
Basement Vestibule Strip Footings (650mm x 350mm)		8 m		
Concrete		2 m3	160.00	291
Formwork		7 m2	150.00	1,008
Reinforcement		146 kg	1.50	218
Footings to landscape retaining walls (800mm x 450mm)		142 m		
Concrete		51 m3	160.00	8,179
Formwork		128 m2	150.00	19,170
Reinforcement		4,090 kg	1.50	6,134
Strip Footings beneath Stairs (1200mm x 450mm)		14 m		
Concrete		8 m3	160.00	1,210
Formwork		30 m2	150.00	4,500
Reinforcement		605 kg	1.50	907
Allowance for foundation 'kicker' walls		55 m		
Concrete		7 m3	160.00	1,056
Formwork		110 m2	150.00	16,500
Reinforcement		627 kg	1.50	941
Waterproofing		22 m2	80.00	1,760
Insulation		22 m2	20.00	440
Allowance for foundation 'kicker' walls - entrance		8 m		
Concrete		1 m3	160.00	154
Formwork		16 m2	150.00	2,400
Reinforcement		77 kg	1.50	115
Waterproofing		3 m2	80.00	256
Insulation		3 m2	20.00	64
Allowance for Excavation to above from reduced level		85 m3	40.00	3,410
Perimeter Drainage		218 m	60.00	13,080
TOTAL A11 Foundations		**2,122 m2**	**43.82**	**92,993**

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Description	Trade	Quantity	Rate	Amount
A12 Basement Excavation				
Mass excavation, dispose off site - allow	+	1,915 m3	30.00	57,450
Extra over for undocumented conditions, rock removal and grubbing up other foundations and the like		1 sum	5745.00	5,745
Allowance for Backfill incl placing		999 m3	40.00	39,960
Allow for slope protection during excavation		1 sum	3000.00	3,000
Allow for partial shoring		1 sum	3500.00	3,500
Allowance for dewatering		1 sum	1000.00	1,000
Allowance for Vibration monitoring to existing bldgs		1 sum	1500.00	1,500
TOTAL A12 Basement Excavation		**1,915 m3**	**58.57**	**112,155**
TOTAL A1 SUBSTRUCTURE				**205,148**

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Description	Trade	Quantity	Rate	Amount
A2 STRUCTURE				
A21 Lowest Floor Construction				
Allow for 150mm concrete, over 200 stone drainage course with mesh reinforcement, incl formwork	+	256 m2	46.00	11,776
Allow for structural fill		64 m3	40.00	2,560
Cut, patch and make good existing floor slab	+	1,866 m2	27.00	50,382
Make connection to existing floor slab		46 m	225.00	10,350
Allow for topping to above concrete bed, including cast in insulation for radiant flooring		256 m2	55.00	14,080
Allow for 150mm concrete as above to basement level		512 m2	46.00	23,552
Allow for structural fill		128 m3	40.00	5,120
Allowance for forming ramps, steps, stairs and like		1 sum	11500.00	11,500
TOTAL A21 Lowest Floor Construction		**2,122 m2**	**60.94**	**129,320**
A22 Upper Floor Construction				
TOTAL A22 Upper Floor Construction				**0**
A23 Roof Construction				
Allow for connection of new structure/make good		46 m	400.00	18,400
Allow for metal roof structure over new atrium	+	256 m2	360.00	92,160
Square hollow section columns to new triple glazed façade assume 8nr		8,448 kg	12.00	101,376
Allow for flashing detailing and accessories		1 sum	10000.00	10,000
no work to existing roof other than noted above	+	1,866 m2	0.00	
TOTAL A23 Roof Construction		**2,122 m2**	**104.59**	**221,936**
TOTAL A2 STRUCTURE				**351,256**

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Description	Trade	Quantity	Rate	Amount
A3 EXTERIOR ENCLOSURE				
A31 Walls Below Grade				
TOTAL A31 Walls Below Grade				**0**
A32 Walls Above Grade				
TOTAL A32 Walls Above Grade				**0**
A33 Windows & Entrances				
Curtain wall to new Glazed Façade and basement entry vestibule based on Pilkington triple glazed spider connection system	+	1,055 m2	3050.00	3,216,225
Square hollow section columns to new triple glazed façade assume 8nr		8,448 kg	12.50	105,600
Allowance for new main entry vestibule - NIC		1 sum	0.00	0
Allowance for frameless glazed double doors		2 pair	4500.00	9,000
Allowance for framless glazed single door		1 leaf	2650.00	2,650
TOTAL A33 Windows & Entrances		**1,055 m2**	**3161.19**	**3,333,475**
A34 Roof Covering				
Allow for 2 ply SBS membrane covering with high albedo reflective coating	+	256 m2	215.28	55,112
TOTAL A34 Roof Covering		**256 m2**	**215.28**	**55,112**
A35 Projections				
TOTAL A35 Projections				**0**

Description	Trade	Quantity	Rate	Amount
TOTAL A3 EXTERIOR ENCLOSURE				**3,388,587**
TOTAL A SHELL				**3,944,991**

Description	Trade	Quantity	Rate	Amount
B1 PARTITIONS & DOORS				
B11 Partitions				
Drywall partitions	+	1,319 m2		
16mm drywall board		1,319 m2	18.00	23,735
Metal Studs		1,319 m2	45.00	59,337
Batt Insulation		1,319 m2	17.00	22,416
16mm drywall board		1,319 m2	18.00	23,735
Allow for glazed partitions to Offices	+	270 m2	400.00	108,000
Furring and boxing		1 sum	6500.00	6,500
Rough Carpentry		1 sum	7500.00	7,500
Sealing and Caulking		1 sum	3000.00	3,000
TOTAL B11 Partitions		**1,589 m2**	**160.03**	**254,223**
B12 Doors				
Allow for Solid Core Wood door, incl hardware, fitting	+	4 no	1500.00	6,000
Allow for frameless glazed door incl hardware, fitting	+	21 no	2250.00	47,250
Allow for Automatic Door Openers		5 no	3500.00	17,500
TOTAL B12 Doors		**25 no**	**2830.00**	**70,750**
TOTAL B1 PARTITIONS & DOORS				**324,973**

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Description	Trade	Quantity	Rate	Amount
B2 FINISHES				
B21 Floor Finishes				
Allow porcelain tiled flooring, inc bases - type 1	+	962 m2	140.00	134,680
Allow porcelain tiled flooring, inc bases - type 2	+	212 m2	140.00	29,680
Allow for carpet to new Offices, inc bases	+	617 m2	50.00	30,850
Floor finish allowed to CRU - NIC	+	331 m2	0.00	0
TOTAL B21 Floor Finishes		**2,122 m2**	**91.99**	**195,210**
B22 Ceiling Finishes				
ACT - Acoustic Ceiling Tile, with grid	+	1,535 m2	60.00	92,100
PGB - Painted Gypsum Board with grid to CRU	+	331 m2	55.00	18,205
PGB - Painted Gypsum Board with grid to Atrium soffit	+	256 m2	107.64	27,556
Allowance for feature ceiling area - NIC		1 sum	0.00	0
Allowance for bulkheads		1 sum	7500.00	7,500
TOTAL B22 Ceiling Finishes		**2,122 m2**	**68.50**	**145,361**
B23 Wall Finishes				
Painting to drywall	+	2,637 m2	8.60	22,680
Allow for ceramic tiling to kitchen area	+	5 m2	118.00	590
Allowance for work to reveals of existing façade and exposed concrete		1 sum	15000.00	15,000
Allowance for 'art features' - NIC		1 sum	0.00	0
TOTAL B23 Wall Finishes		**2,642 m2**	**14.48**	**38,270**
TOTAL B2 FINISHES				**378,841**

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Description	Trade	Quantity	Rate	Amount
B3 FITTINGS & EQUIPMENT				
B31 Fittings & Fixtures				
Room Furniture as per Drawing A108 room uses				
Large Meeting Rooms (rooms 27, 28, 29)				
Coat Hooks		6 no	15.00	90
Waste Recepticle - NIC		3 no	0.00	0
Allow for large table - NIC		3 no	0.00	0
Allow chairs for 50 people - NIC		50 no	0.00	0
Allowance for credenza/storage unit - NIC		3 no	0.00	0
Small Meeting Rooms (rooms 24, 25, 26)				
Coat Hooks		6 no	15.00	90
Waste Recepticle - NIC		3 no	0.00	0
Allow for mid-sized table - NIC		3 no	0.00	0
Allow chairs for 20 people - NIC		20 no	0.00	0
Allowance for credenza/storage unit - NIC		3 no	0.00	0
Student Union Offices (rooms 1 through 19)				
Coat Hook		38 no	15.00	570
Waste Recepticle - NIC		38 no	0.00	0
Allow for desk - NIC		19 no	0.00	0
Allow chairs for 3 people/office - NIC		57 no	0.00	0
Allowance for credenza/storage unit - NIC		19 no	0.00	0
Furniture to circulation areas (274 seats as A108)				
Allow 60% soft furnished, bespoke design - NIC		164 no	0.00	0
Allow 40% hard furnished catalogue design - NIC		110 no	0.00	0
Allow for mixed tables to be designed - NIC		36 no	0.00	0
Extra over allowance for forming 3 large curved units to circulation area - NIC		3 no	0.00	0
Extra over allowance for forming 3 large curved units and centre piece to offices - NIC		1 sum	0.00	0
Kitchen				
Plastic Laminate Countertop		6 m	495.00	2,970
Allow for base cabinets		6 m	500.00	3,000
Allow for wall cabinets		6 m	350.00	2,100
Millwork				
Allow for Office Reception desk, complete with chair and waste receptacle		1 sum	6500.00	6,500
Allowance for Waste/Recycling stations		3 no	2000.00	6,000
Allowance for Communication Boards		3 no	500.00	1,500
Allowance for automatic blinds to glazed feature entrance - NIC		1 sum	0.00	0

Description	Trade	Quantity	Rate	Amount
TOTAL B31 Fittings & Fixtures		**2,122 m2**	**10.75**	**22,820**
B32 Equipment				
Kitchen Equipment - Not Included				
Flat Screen TV Equipment - Not Included				
Interior Signage - Not Included				
TOTAL B32 Equipment				**0**
B33 Conveying Systems				
NIC				
TOTAL B33 Conveying Systems				**0**
TOTAL B3 FITTINGS & EQUIPMENT				**22,820**
TOTAL B INTERIORS				**726,634**

Description	Trade	Quantity	Rate	Amount
C1 MECHANICAL				
C11 Plumbing & Drainage				
Equipment				
(Subtotal Equipment $0)				
Piping				
cold water		20 m	72.00	1,440
hot water		20 m	72.00	1,440
hot water recirculation		20 m	65.00	1,300
sanitary and vents		40 m	85.00	3,400
storm drainage- not required		0	0.00	0
connect to existing		1 sum	1500.00	1,500
trenching		15 m	60.00	900
(Subtotal Piping $9,980)				
Fixtures				
double compartment sink		1 no	1000.00	1,000
rough-in kitchenette		1 sum	750.00	750
drinking fountains - allow		1 no	3500.00	3,500
(Subtotal Fixtures $5,250)				
Atrium Drainage				
roof drain		2 no	1000.00	2,000
storm drainage		1 sum	5000.00	5,000
connect to existing services		1 sum	1500.00	1,500
weeping tile drainage		40 m	100.00	4,000
(subtotal Atrium Drainage $12,500)				
TOTAL C11 Plumbing & Drainage		**2,122 m2**	**13.07**	**27,730**
C12 Fire Protection				
Sprinkler				
modify existing sprinkler coverage to suit new layout		1,866 m2	15.00	27,990
(Subtotal Sprinkler $27,990)				
Sprinkler to Atrium area				
new sprinkler coverage at high level		256 m2	45.00	11,520
window sprinkler heads		45 no	350.00	15,750
zoned valve		1 no	1250.00	1,250
connect to existing		1 sum	2500.00	2,500
(Subtotal Sprinkler to Atrium area $31,020)				
Standpipe System				
no works				
(subtotal Standpipe System $0)				

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Description	Trade	Quantity	Rate	Amount
Miscellaneous				
fire extinguishers		1 sum	1500.00	1,500
(Subtotal Miscellaneous $1,500)				
TOTAL C12 Fire Protection		**2,122 m2**	**28.52**	**60,510**
C13 HVAC				
Air Handling				
Existing Air Handling unit - Basement supply - Add VFD on fans, replace fans, new steam coil, new filtration section and repair AHU panel (23,000cfm)		23,000 cfm	4.00	92,000
Ventilation and exhaust fans:				
smoke exhaust at Atrium area - not required		1 no	0.00	0
kitchenette fan		1 sum	1500.00	1,500
miscellaneous fans		1 sum	3000.00	3,000
(Subtotal Air Handling $96,500)				
Heating Plant				
no work to existing				
hot water circulation pumps		2 no	3500.00	7,000
steam to hot water heat exchanger		1 no	15000.00	15,000
miscellaneous relocation		1 sum	5000.00	5,000
(Subtotal Heating Plant $27,000)				
Cooling Plant				
no work required to existing				
chilled water pumps - VFD		2 no	3500.00	7,000
miscellaneous relocation		1 sum	5000.00	5,000
(Subtotal Cooling Plant $12,000)				
Miscellaneous				
testing and balancing		1 sum	5000.00	5,000
selective demolitions		1,866 m2	20.00	37,320
fuel oil system - NIC				
(Subtotal Miscellaneous $42,320)				
Piping				
hot water supply and return to perimeter radiation		100 m	85.00	8,500
chilled water supply and return to perimeter radiation		100 m	85.00	8,500
hot water supply and return to in-floor heating		180 m	85.00	15,300
chilled water supply and return to in-floor heating		180 m	85.00	15,300
connect to existing		4 no	1500.00	6,000
(Subtotal Piping $53,600)				
Ductwork and Air Distribution				
galvanized steel ductwork		8,300 kg	17.00	141,100
VAV boxes		30 no	761.36	22,841
fan powered box		2 no	1500.00	3,000
diffusers, registers and grilles		134 no	150.00	20,100

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Description	Trade	Quantity	Rate	Amount
displacement air diffusers at radiant floor area		25 no	250.00	6,250
motorized dampers		1 sum	3000.00	3,000
(Subtotal Ductwork and Air Distribution $196,291)				
Heating Devices				
in floor heating/cooling to Atrium area concrete topping and insulation to above - see Architectural measure		256 m2	120.00	30,720
dual circuit radiant panels at Atrium		40 m	550.00	22,000
force flow heater at main vestibule		1 no	3000.00	3,000
(Subtotal Heating Devices $55,720)				
TOTAL C13 HVAC		**2,122 m2**	**227.82**	**483,431**
C14 Controls				
Full DDC controls				
Air Handling Units		1 no	15000.00	15,000
VAV boxes		30 no	761.36	22,841
perimeter radiation		2 no	750.00	1,500
in floor heating zone included circulators		2 no	2500.00	5,000
unit heaters / force flow heaters		1 no	500.00	500
pumps		4 no	1500.00	6,000
heat exchanger		1 no	1500.00	1,500
exhaust fans		2 no	750.00	1,500
interface with existing		1 sum	3000.00	3,000
CO sensors - NIC				
computer hardware, software and programming - use existing				
TOTAL C14 Controls		**2,122 m2**	**26.79**	**56,841**
TOTAL C1 MECHANICAL				**628,512**

Description	Trade	Quantity	Rate	Amount
C2 ELECTRICAL				
C21 Service & Distribution				
Normal Power				
Existing to remain				
(Subtotal Normal Power $0)				
Emergency Power				
Existing to remain				
(Subtotal Emergency Power $0)				
Distribution				
Allowance to modify existing and provide new panels, feeders, etc - normal power		1 sum	79000.00	79,000
Allowance to modify existing and provide new panels, feeders, etc - emergency power		1 sum	10000.00	10,000
Allowance for feeders and disconnect switches in shell space		1 sum	25000.00	25,000
Permits, inspections and job setup		1 sum	5000.00	5,000
(Subtotal Distribution $119,000)				
Motor Wiring				
Wire & connect Mechanical equipment		1 sum	8000.00	8,000
(Subtotal Motor Wiring $8,000)				
TOTAL C21 Service & Distribution		**2,122 m2**	**59.85**	**127,000**
C22 Lighting, Devices & Heating				
Lighting				
Offices		1 sum	27600.00	27,600
Meeting rooms		1 sum	24200.00	24,200
Seating areas		1 sum	88500.00	88,500
Shell Space		1 sum	3800.00	3,800
Exterior canopy light fitures c/w wiring		4 no	650.00	2,600
Dimming systems for:				
small meeting rooms		3 no	3000.00	9,000
large meeting rooms		3 no	4500.00	13,500
Allowance for lighting controls including occupancy sensors, etc		1 sum	20000.00	20,000
(Subtotal Lighting $189,200)				
Power				
Offices		1 sum	10400.00	10,400
Meeting rooms		1 sum	8100.00	8,100
Seating areas		1 sum	17000.00	17,000
Shell space		1 sum	1500.00	1,500
Miscellaneous power connection		1 sum	5000.00	5,000

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Description	Trade	Quantity	Rate	Amount
(Subtotal Power $42,000)				
Heating				
by Mechanical				
(Subtotal Heating $0)				
TOTAL C22 Lighting, Devices & Heating		**2,122 m2**	**108.95**	**231,200**
C23 Systems & Ancillaries				
Fire Alarm				
Allowance to modify existing head end equipment including re-programming		1 sum	7500.00	7,500
Allowance to modify existing remote annunciator		1 sum	1000.00	1,000
Allowance for fire alarm devices, testing, verification, etc		1 sum	16000.00	16,000
(Subtotal Fire Alarm $24,500)				
Security				
Allowance to modify existing head end equipment		1 sum	3500.00	3,500
Allowance for new security devices and wiring		1 sum	29000.00	29,000
(Subtotal Security $32,500)				
Communication				
Empty conduit to ceiling:				
Telephone outlet		10 no	90.00	900
Data outlet		25 no	90.00	2,250
Telephone/Data outlet		30 no	90.00	2,700
Cable TV outlet		15 no	90.00	1,350
Cabling		110 no	220.00	24,200
Plywood backboard		2 no	140.00	280
27mm emt conduit to retail units		1 sum	2500.00	2,500
Allowance for cable tray		1 sum	10000.00	10,000
Allowance for trunk conduit and cabling		1 sum	12000.00	12,000
Allowance for racks, patch panels, etc		1 sum	7000.00	7,000
Active hardware - by others				
(Subtotal Communication $63,180)				
PA System				
Head end equipment - assumed existing is adequate				
Remove and relocate existing PA speakers to suit new layout		20 no	160.00	3,200
New PA Speakers		5 no	280.00	1,400
Device wiring		25 no	170.00	4,250
(Subtotal Sound System $8,850)				
Audio Visual system				
Equipment, devices and wiring - by others				
Empty conduit in meeting rooms - small		3 no	1500.00	4,500
Empty conduit in meeting rooms - large		3 no	2500.00	7,500
(Subtotal AV System $12,000)				

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Architect: DIALOG

File: MAH-OoM-0
Date: Jan 5, 2012
Project Number: 20179
Gross Floor Area: 2122 m2

Description	Trade	Quantity	Rate	Amount
Miscellaneous				
Demolition and circuit continuity		1 sum	17000.00	17,000
Cutting and patching		1 sum	3000.00	3,000
Lightning protection - NIC				
(Subtotal Miscellaneous $20,000)				
TOTAL C23 Systems & Ancillaries		**2,122 m2**	**75.89**	**161,030**
TOTAL C2 ELECTRICAL				**519,230**
TOTAL C SERVICES				**1,147,742**
NET BUILDING COST (EXCLUDING SITE)				**5,819,367**

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Description	Trade	Quantity	Rate	Amount
D1 SITE WORK				
D11 Site Development				
Allowance for landscaping retaining walls		142 m		
Concrete		96 m3	160.00	15,336
Formwork		639 m2	150.00	95,850
Reinforcement		7,668 kg	1.50	11,502
Waterproofing		320 m2	80.00	25,560
Drainmat		320 m2	70.00	22,365
Allowance for handrails/fall protection		122 m	320.00	39,040
Allowance for new surfacing and base (400m2)		1 sum	22000.00	22,000
Allowance for curbing to suit new layout		1 sum	2500.00	2,500
Planter area to right of entry stair - assume concrete		1 no	8500.00	8,500
Allow for site furniture (garbage bins, benches and the like)		1 sum	3500.00	3,500
Allowance for Bike Racks		3 no	1000.00	3,000
Allowance for planting medium		1 sum	2250.00	2,250
Allowance for planting (450m2)		1 sum	11250.00	11,250
	+	850 m2		
TOTAL D11 Site Development		**850 m2**	**309.00**	**262,653**
D12 Mechanical Site Services				
Natural gas - by utility				
allowance for miscellaneous service relocation and removal		1 sum	20000.00	20,000
	+	850 m2		
TOTAL D12 Mechanical Site Services		**850 m2**	**23.53**	**20,000**
D13 Electrical Site Services				
Building Service				
- existing to remain				

Description	Trade	Quantity	Rate	Amount
(Subtotal Building Service $0)				
Site, Lighting and Power				
Wall recessed lighting fixture c/w wiring at ramp		3 no	550.00	1,650
Allowance for landscape lighting		1 sum	10000.00	10,000
Exterior lighting controls		1 sum	1800.00	1,800
(Subtotal Site Lighting and Power $13,450)				
	+	850 m2		
TOTAL D13 Electrical Site Services		**850 m2**	**15.82**	**13,450**
TOTAL D1 SITE WORK				**296,103**

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Description	Trade	Quantity	Rate	Amount
D2 ANCILLARY WORK				
D21 Demolition				
Internal				
Allowance for the removal of existing suspended ceiling system, make good - dispose off site	+	1,866 m2	2.50	4,665
Allowance for the removal of existing flooring, make good - dispose off site		1,866 m2	1.50	2,799
Allowance for the safe disconnection and strip out of existing wiring and mechanical plant		1,866 m2	3.25	6,065
Allowance for the removal of stud partition walling including limited areas of glazed partition, make good - dispose off site		612 m	7.50	4,590
Allowance for the removal of existing doors and surrounds, dispose off site		71 no	14.09	1,000
Allow for the removal of all associated M&E plant and equipment remaining (lights and fixtures, vents and fans, etc)		1 sum	6500.00	6,500
External				
Allow for careful removal of existing reinforced concrete façade and make good - dispose off site		1 sum	18000.00	18,000
Allow for careful removal, including disconnection of existing lamp standards and make good - dispose off site		1 sum	1500.00	1,500
Allow for clearing site area and grubbing up existing kerbing - dispose off site		1 sum	2000.00	2,000
Allow for grubbing up existing trees store off site		1 sum	3500.00	3,500
Allow for removal and disposal of existing picnic bench - dispose off site		1 sum	750.00	750
Allow for the removal of existing exterior glazing system and make good - dispose off site		1 sum	7500.00	7,500
Allow for the removal of existing glazed entry lobby and make good - dispose off site		1 sum	2500.00	2,500
Allow for the careful removal of existing concrete entrance canopy and make good - dispose off site		1 sum	8500.00	8,500
Allow for removal of existing concrete walkway/bridge structure, make good - dispose off site		1 sum	12500.00	12,500
Allow for removal of existing concrete stairs and associated handrails, etc, to walkway/bridge, make good - dispose off site		1 sum	3500.00	3,500
Allow for the removal of existing concrete access ramp - grub up associated foundations, make good, dispose off site		1 sum	5000.00	5,000
Allow for the removal of existing concrete planter structures, make good - dispose off site		1 sum	3500.00	3,500
Allow for the removal of existing concrete retaining walls below grade, make good and secure earth behind - dispose off site		1 sum	10000.00	10,000

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Description	Trade	Quantity	Rate	Amount
Allow for the removal of existing asphalt surfacing, make good - dispose off site		1 sum	2500.00	2,500
TOTAL D21 Demolition		**1,866 m2**	**57.27**	**106,869**
D22 Alterations				
Allowance to clean existing façade retained indoors		1 sum	4500.00	4,500
Allow for 300mm slab poured, forming entrance bridge		13 m		
Concrete		18 m3	160.00	2,903
Formwork - including propping		23 m2	250.00	5,760
Reinforcement		1,724 kg	1.50	2,586
Finish		60 m2	15.00	907
Allow for downstand beam to support entrance bridge (450mm x 850mm)		13 m		
Concrete		5 m3	160.00	796
Formwork - including propping		27 m2	250.00	6,773
Reinforcement		472 kg	1.50	709
Allowance for forming new reinforced concrete stair from grade to new bridge		1 sum	4500.00	4,500
Cut, patch and make good existing floor slab		46 m2	27.00	1,242
Allowance for Spiral Stair, complete with hand rail - NIC		1 sum	0.00	0
TOTAL D22 Alterations	+	2,122 **2,122 0**	**14.46**	**30,676**
TOTAL D2 ANCILLARY WORK				**137,545**
TOTAL D SITE & ANCILLARY WORK				**433,648**
NET BUILDING COST (INCLUDING SITE)				**6,253,015**

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Description	Trade	Quantity	Rate	Amount
Z1 GENERAL REQUIREMENTS & FEE				
Z11 General Requirements				
General Requirements		ls		625,000
TOTAL Z11 General Requirements				**625,000**
Z12 Fee				
Fee		ls		188,000
TOTAL Z12 Fee				**188,000**
TOTAL Z1 GENERAL REQUIREMENTS & FEE				**813,000**
TOTAL CONSTRUCTION ESTIMATE EXCLUDING ALLOWANCES				**7,066,015**

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4 AREA SUMMARY

Description	Trade	Quantity	Rate	Amount
Z2 CONTINGENCIES				
Z21 Estimating Contingency				
Estimating Contingency		ls		707,000
TOTAL Z21 Estimating Contingency				**707,000**
Z22 Escalation Contingency				
Escalation Contingency		ls		141,000
TOTAL Z22 Escalation Contingency				**141,000**
Z23 Construction Contingency				
Construction Contingency		ls		353,000
Total Z23 Construction Contingency				**353,000**
TOTAL Z2 CONTINGENCIES				**1,201,000**
TOTAL Z GENERAL REQUIREMENTS & CONTINGENCIES				**2,014,000**
TOTAL BUILDING COST INCLUDING ALLOWANCES				**8,267,015**

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Jan 5, 2012

Students Union, University of Alberta

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AREA SUMMARY

	Enclosed (m2)	Void (m2)	GFA (m2)
Above Grade			
Ground Floor	2,112	0	2,112
Total	**2,112**	**0**	**2,112**

Net		
Offices	617	
Study/Gathering areas	212	
CRU Space	331	
		1,160
Circulation		
Circulation areas	962	
		962
Mech & Elec		
N/A	0	
		0
Walls & Shafts		
N/A	0	
		0
Total		**2,122**

Grossing Factor		
Net	1,160	**100%**
Circulation	962	**83%**
Mech & Elec	0	**0%**
Walls & Shafts	0	**0%**
Total	2,122	**183%**

For Students Union, University of Alberta
Students Union, Edmonton

Turner & Townsend

5 DOCUMENTATION

Ref: 20179
Date: Jan 5, 2012

Students Union, University of Alberta

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Architectural

Provided by: Dialog

Number	Name	Date	Date Received
-	Sub Renovation + Addition Design Presentation - Aerial Perspective	Dec 5, 2011	Dec 12, 2011
-	Sub Renovation + Addition Design Presentation - Site Plan	Dec 5, 2011	Dec 12, 2011
-	Sub Renovation + Addition Design Presentation - Basement Furniture La	Dec 5, 2011	Dec 12, 2011
-	Sub Renovation + Addition Design Presentation - Section 1	Dec 5, 2011	Dec 12, 2011
-	Sub Renovation + Addition Design Presentation - Section B	Dec 5, 2011	Dec 12, 2011
-	Sub Renovation + Addition Design Presentation - Section C	Dec 5, 2011	Dec 12, 2011
-	Sub Renovation + Addition Design Presentation - Section A	Dec 5, 2011	Dec 12, 2011
-	Sub Renovation + Addition Design Presentation - Aerial Perspective	Dec 5, 2011	Dec 12, 2011
-	Sub Renovation + Addition Design Presentation - South Perspective	Dec 5, 2011	Dec 12, 2011
-	Sub Renovation + Addition Design Presentation - Aerial Perspective	Dec 5, 2011	Dec 12, 2011
-	Preliminary Electrical Review	Dec 8, 2012	Dec 12, 2011
-	Preliminary Mechanical Conceptual Design Report - Draft	Dec 8, 2012	Dec 12, 2011
-	Preliminary Structural Feasibility Report	Dec 8, 2012	Dec 12, 2011
A107	SUB_BASEMENT-PERSPECTIVE	Dec 15, 2011	Dec 19, 2011
A108	SUB_BASEMENT-PLAN_alternate	Dec 15, 2011	Dec 19, 2011
-	SUB-existing_basement_plan	-	Dec 21, 2011
-	SUB-existing_main_plan	-	Dec 21, 2011
A110	01257E_SUB-Basement-Revised	Dec 21, 2011	Dec 21, 2011