CONTENTS

INTRODUCTION

The MLC stands for Media Learning Centre, and is used to create a context of learning and sharing for the community, as a component of a wider network of services offered by the city of Cambridge. The centre serves existing residents, as well as new Canadians and is designed as a multi-use, multi-level space for media exchange and education.

The MLC is intended as a public living room, open to all ages, abilities, and ethnicities. The document will begin with an overview of the design, including the building's programme and layout as discussed alongside floorplan and elevation diagrams. This will work to set-up a base knowledge of key spaces in the building, as well as highlight the materiality, small scale, and ease of navigation of the proposal. Barrier-free and life safety strategies are included directly following this, as the design of the building as a terraced interior landscape made these components exceptionally important to understand. Care has been taken to consider all aspects and scales of barrier-free design to create a non-discriminate space which is welcoming to all members of the community. This is reflected from the furniture scale to the circulation scale, to ensure programmatic needs are met in multi-use spaces for all visitors

Splitting into three segments, structure & envelope, interior, and exterior, the environmental strategies which informed the design of the building will be examined further. Structure and envelope explore the detailing required in creating an enclosed building. The efficient design strategies heading examines the steps taken to regulate exterior systems for use inside the building, while environmental strategies tackle exterior systems regulated to obtain ideal interior environments. The report will conclude with a reflection on LEED criteria and the amalgam of all the strategies into the final design.

PROGRAMME DIVISION

MULTIMEDIA, MULTIGENERATIONAL SPACES

The MLC has four main programmatic spaces: a bakery, resource mezzanine, daycare, and theatre. These spaces are organized so that each programme corresponds to a specific level. F-0 (the basement) is the daycare space, F-1 (at grade) is the bakery, F-2 (main entrance level) is where you access the theatre, and F-3 (mezzanine) is the immigrant resource centre and library.

Connecting these spaces are large circulation corridors which are designed as landscapes for movement and inhabitation. The atrium and terraced cafe space are both multi-level spaces with visual connections between floors, and furniture in the peripheries to encourage prolonged stay. These spaces mainly run along the north/south axis, and the atrium is a key component to several of the interior environmental strategies.

Programmatically, the theatre located at the heart of the building is an important piece in the dissemination of knowledge and cultural sharing. It therefore takes up a significant amount of square footage and pierces through multiple levels. Used mainly as a casual movie theatre, doubling as a lecture hall and presentation space, there were several challenges in accommodating the multi-functionality of this space.

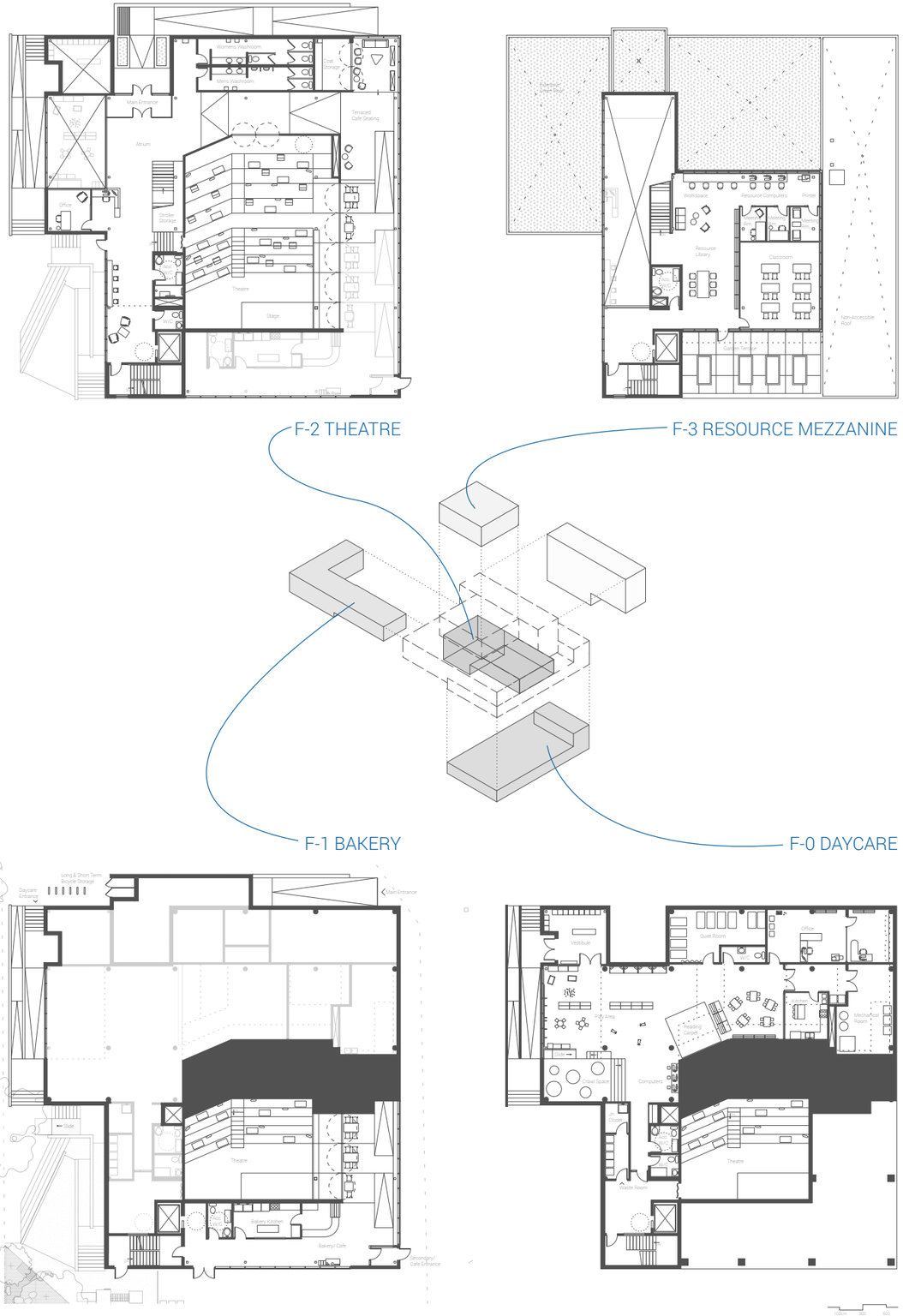
Daycare space looking towards glazed facade

Key considerations thus became finding ways to acoustically separate all the programme spaces, finding ways to block-out or channel daylight as required by programme, accommodate differing

Theatre with rotating doors open to terraced cafe space (lecture setting for the room)

age and accessibility in all spaces, as well as creating a building that was easy to navigate to ensure a welcoming space.

The bakery and daycare space serve as external income for the building as a whole, and are designed as such with their own entrances and required spaces. The mezzanine and theatre space service the cultural resource and immigration requirements of the project, and are imagined as components which contribute missing spaces to the existing network of services in Cambridge. The resource mezzanine, as a consolidated library with bookmarked service websites, and access to computers, printers, and enclosed offices. While the theatre fills the void of a community lecture hall space in the Idea Exchange network.



THEATRE SECTION

DAYCARE SECTION

LIFE SAFETY & BARRIER FREE DESIGN

INDISCRIMINATE DESIGN DECISIONS

Considerations for life safety and barrier-free design played large roles in influencing the design of the building. Conceptually, the interior terrain becomes a key component of the experience of traveling through the building, and acts as programmatic separation. Thus, ramps and access to the elevator became important so that these spaces can be enjoyed by everyone. Incorporated into these barrier-free strategies was the choice of certain pieces of furniture, so that spaces were always easily accessible, and accommodating. The adjacent images of furniture show an idea of how these needs can be accounted for. The daycare is mainly an open single storey space with furniture sized for children. In the cafe, the furniture is light-weight and easily cleanable, and stackable, the lack of armrests accommodates varying body sizes and shapes, while the height of all the tables allows for a wheelchair to fit comfortably. Similarly, in the resource mezzanine armrest-less chairs, and a wheelchair height table work to accommodate; of note, the Odger chairs are a composite recycled paper and plastic material.[1] In the classroom, the stackable clean-able chairs make an appearance, along with movable desks which can be rearranged for different types of work. As well, in the enclosed office spaces Setu chairs provide a height-adjustable seating solution with height adjustable desks for an ergonomic work environment; of note, the Setu chairs can be completely disassembled and are 90% recyclable.[2]

In the following spread, life safety, bike, circulation, and multi-use layouts are considered. These contribute to creating a healthy, accommodating building for the variety of uses expected in these spaces. The bike strategies are directly compliant with LEED checklist requirements. The circulation and muti-use layouts expand upon the design intentions of the building, to give a sense of how the furniture and circulation corridors can be used as needs change.

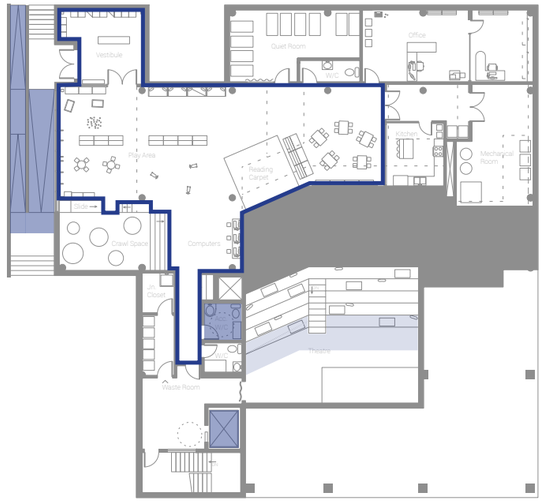
Child-Sized Daycare Furniture (F-0)

Movable Cafe Furniture (F-1 & 2)

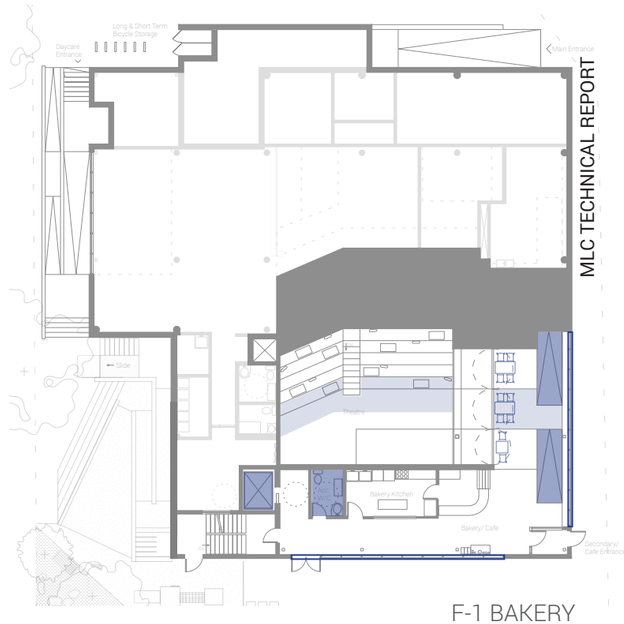
Work Table Furniture (F-3)

Classroom Furniture (F-3)

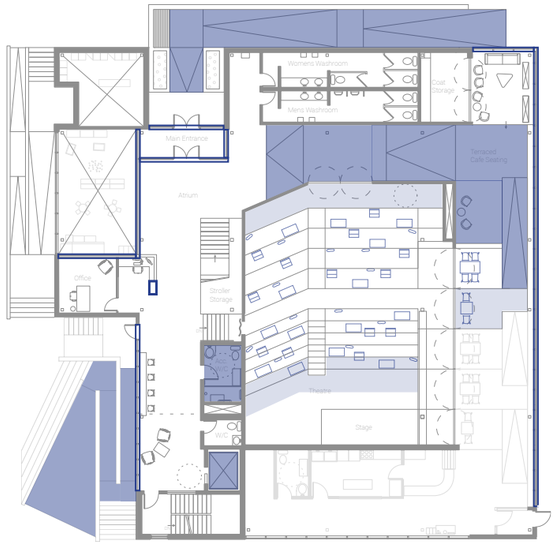
Enclosed Office Furniture (F-2 & 3)



F-0 DAYCARE



F-1 BAKERY



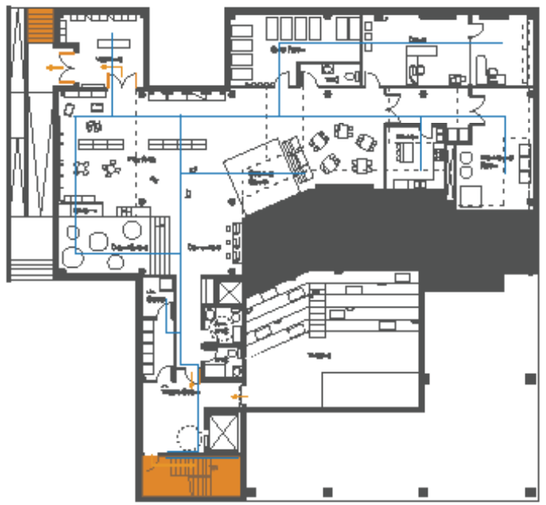
F-2 THEATRE

F-3 RESOURCE MEZZANINE

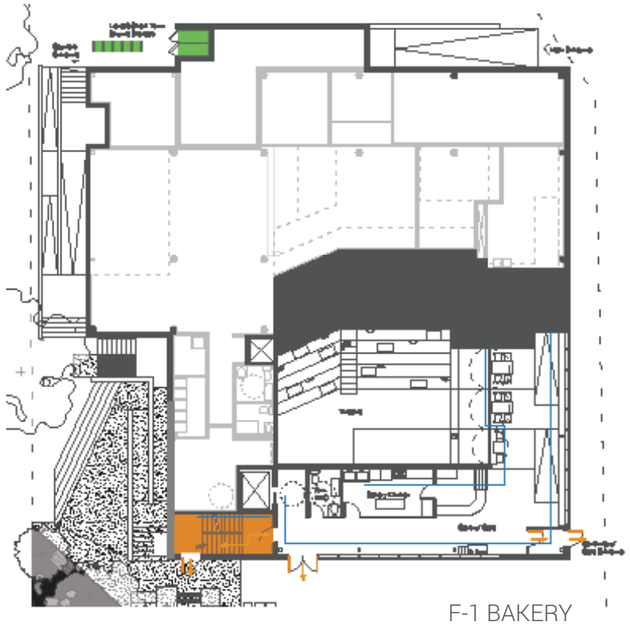
100cm 300 500

BARRIER FREE PATHS, & FURNITURE

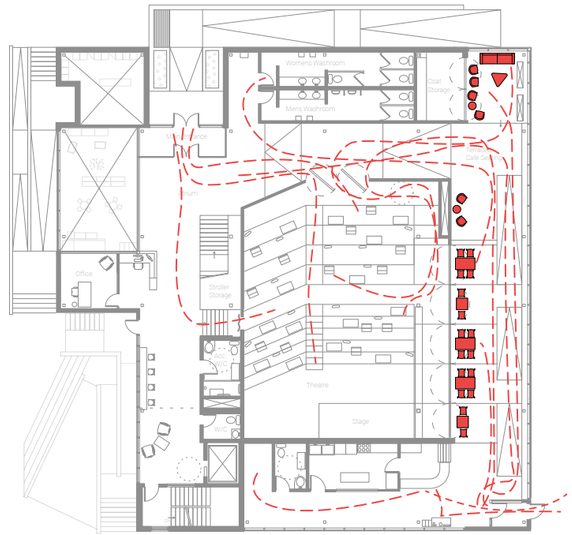
Dark blue fill indicates accessible design strategies including: ramps, the elevator, accessible washrooms, and the single-storey daycare space. The thicker blue outline indicates ceiling to slab glazing, allowing for views to the exterior from all heights. The furniture outlined in blue indicates furniture or designed pieces which are chosen with accessibility in mind (many of which are seen on the adjacent page), this includes raised planters on the outdoor terrace, a wheelchair height portion of the front desk, and cushions and backrest modules in the theatre.



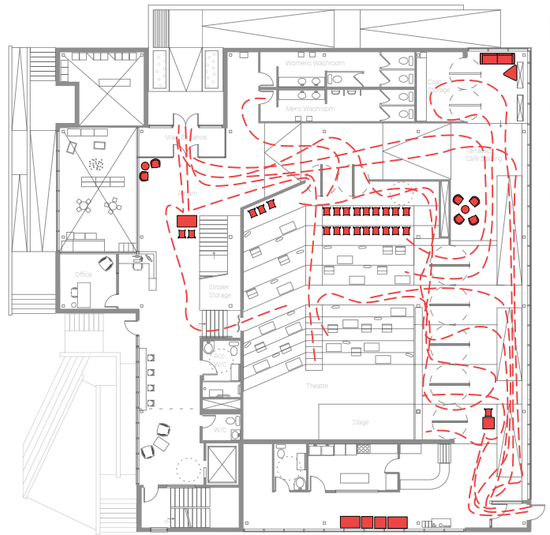
F-0 BASEMENT



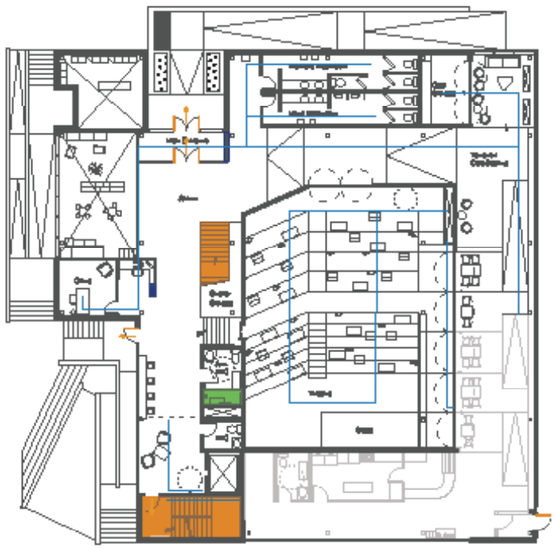
F-1 BAKERY



THEATRE – MOVIE MODE



THEATRE – LECTURE MODE



F-2 THEATRE

F-3 RESOURCE MEZZANINE

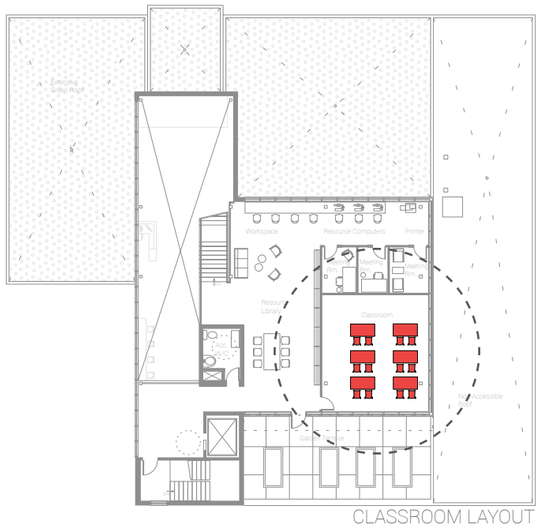
100cm 300 500

LIFE SAFETY & BIKE STRATEGIES

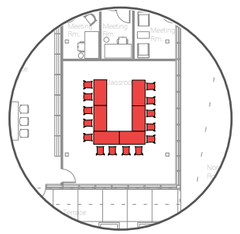
The orange fill indicates paths of egress, these are typically located near to an orange door which indicates an exit to the exterior, and includes proper exit signage for ease of navigation and panic bars on all exit doors. Bike strategies accommodate LEED requirements and are indicated in green, this includes short-term bike racks, long term bike lockers, and an accessible shower located off of the atrium.[3] Potential sprinkler runs are indicated in blue, the building is completely sprinklered and equipped with working fire detection and alarm systems.

CIRCULATION & MULTI-USE SPACE

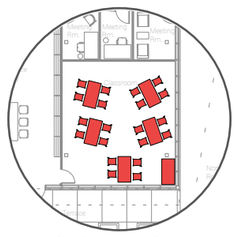
These diagrams indicate the potential relationship between the cafe and the theatre, transitioning between an enclosed dark space in movie mode, to an open day lit space for lecture mode. Movable furniture in the cafe allows for manipulation and relocation to service different needs as ticket booth space, snack tables, accommodating seating in the theatre, and lounge spaces throughout.



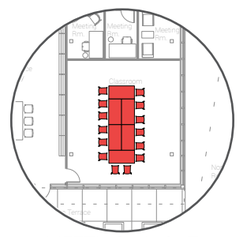
CLASSROOM LAYOUT



SEMINAR LAYOUT



GROUP LAYOUT



MEETING LAYOUT

CIRCULATION & MULTI-USE SPACE

These diagrams indicate the different layout potentials of the classroom space in the resource mezzanine. This space, along with the adjacent meeting rooms provide the community, and particularly new Canadians, with workspaces and meeting rooms that are open and adjustable to their needs. The classroom can be used as a large meeting or seminar room, in addition to servicing the needs of a classroom space.

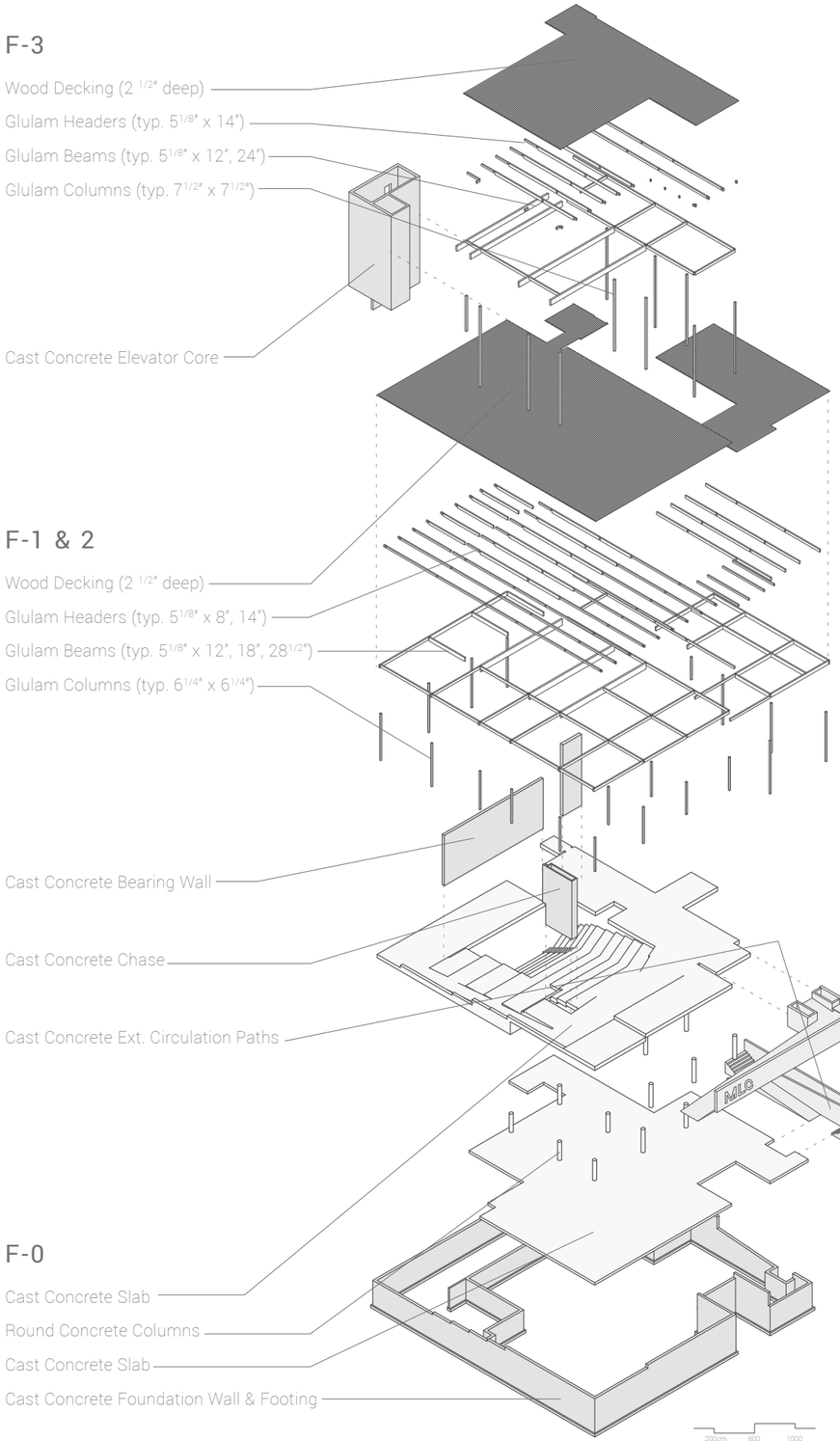
STRUCTURE

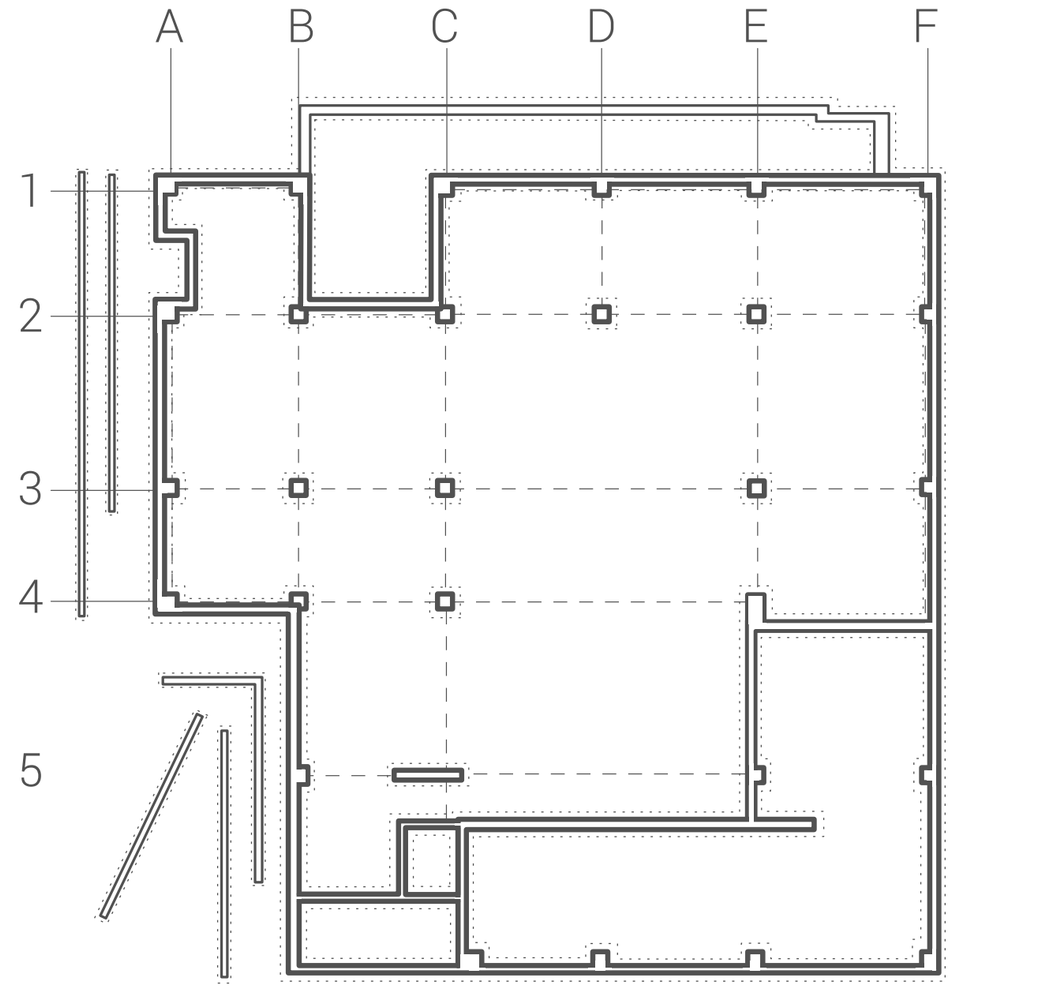
WOOD & CONCRETE

The structural composition of the building can be simply described as glulam sitting atop a concrete base. In designing the building, this was the goal aesthetically and structurally. The structural composition begins at the foundations and footings below grade, continuing through F-0 at the foundation walls and round concrete bearing columns, the floor plane of F-1 and F-2 is a poured concrete slab. This is the finish for the floor at this level, and allows the landscape of the terrace cafe and theatre space to read as a single material being manipulated to form steps and ramps. This also allows for radiant heating tubes to be cast in place during construction on F-0, F-1, and F-3. The concrete has a compliant amount of fly-ash (30%) mixed into the composition to incorporate waste material into the concrete, thus reusing potentially discarded material from steel processing.[4]

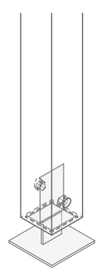
At F-2 the structure changes from concrete to glulam. Glulam columns connect to the concrete floor using an embedded metal plate and bolt connection to create the feeling of the glulam floating above the concrete. Connected to the columns are a series of main structural beams and headers which support a standard wood deck as the sheathing. The intention is to leave the structure exposed (as seen in the image behind) with the service lines, and lighting exposed to below so that the structure and texture of the beam and deck composition can be read from below. This type of construction continues up to F-3, where the resource mezzanine is designed to feel like a "wood box floating above the theatre". The glulam beams are of varying depth, according to span, and are sized to handle snow, live and dead loads.[5]

The elevator core, theatre screen bearing wall, and washroom bearing wall (seen in foundation plan) are concrete walls that continue up to either the floor plate of F-3 or the roof. These, in addition to the wall assemblies of the rest of the building, deal with shear, and lateral stresses on the envelope and main structure.

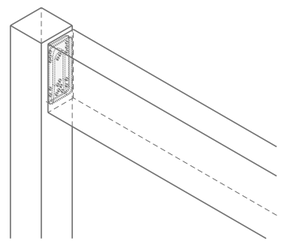




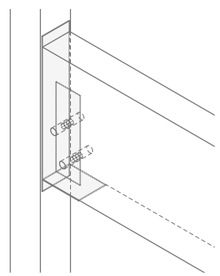
FOUNDATION PLAN



FLOATING CONNECTION
F-1 & 2
(WOOD TO CONCRETE)



SHERPA CONNECTION
F-1, 2 & 3
(WOOD TO WOOD, WOOD TO CONCRETE)



SEMI-CONCEALED CONNECTION
THEATRE
(WOOD TO WOOD)

SKIN & ENVELOPE

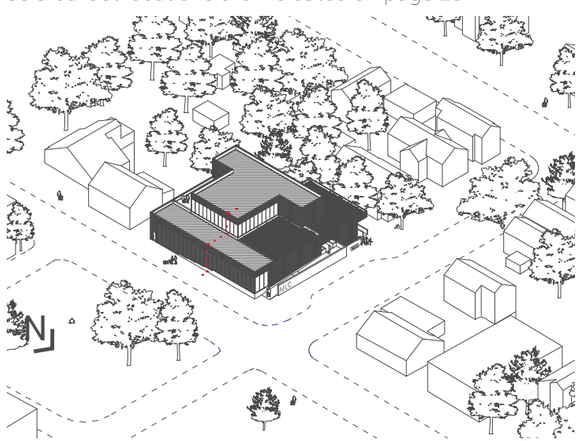
ROOF AND WALL

The building envelope is clad in wood siding, and in a few places the foundation wall (Thermomass CIP Assembly) is exposed as the exterior finish as well. This is indicated in the adjacent elevations.

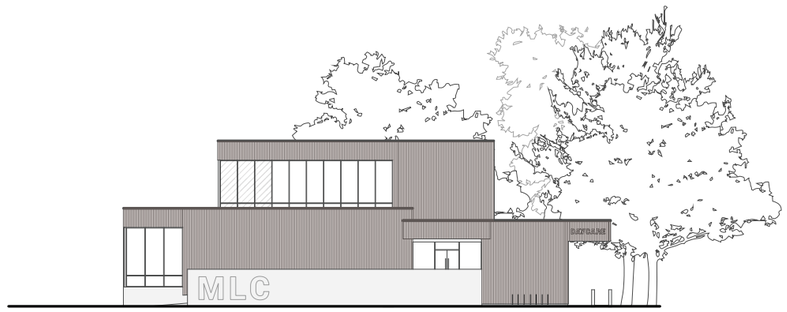
In the following spread, two section details dissect the composition of the wall, roof, and foundation, as they are on the east facade (section line indicated by red dotted line on isometric view below). The wall is wood clad, with polyisocyanurate insulation, a self-adhered air and vapor barrier, Densglas sheathing on steel studs, tied back to the main glulam structure, and finished with gypsum wall board on the interior.

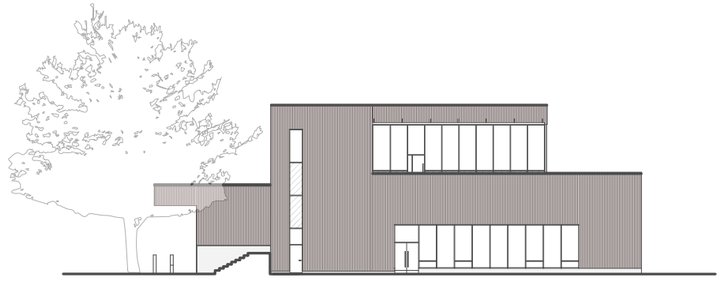
The foundation is a Thermomass CIP assembly[6], which allows for sufficient insulation and an exposed concrete exterior finish. The Thermomass system reduces thermal bridging above grade, and is composed of extruded polystyrene insulation sandwiched by cast concrete walls. The system allows the contractor to use regular formwork[7] to create the wall, and reduces vapor diffusion into the interior of the basement.

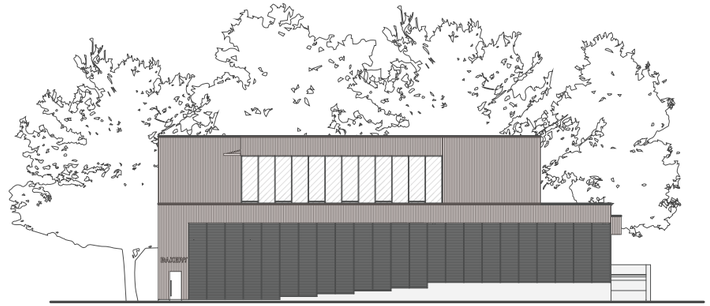
There are three roof finish types on the building, all are inverted roof compositions with varying types of ballast. The one detailed has a river stone ballast, a paving stone ballast occurs at the outdoor terrace, while the green roof as a ballast locations are indicated on page 29.



Note: Air, vapor barrier spec's on both roof and wall are provided in referencing the Soprema website.[8]



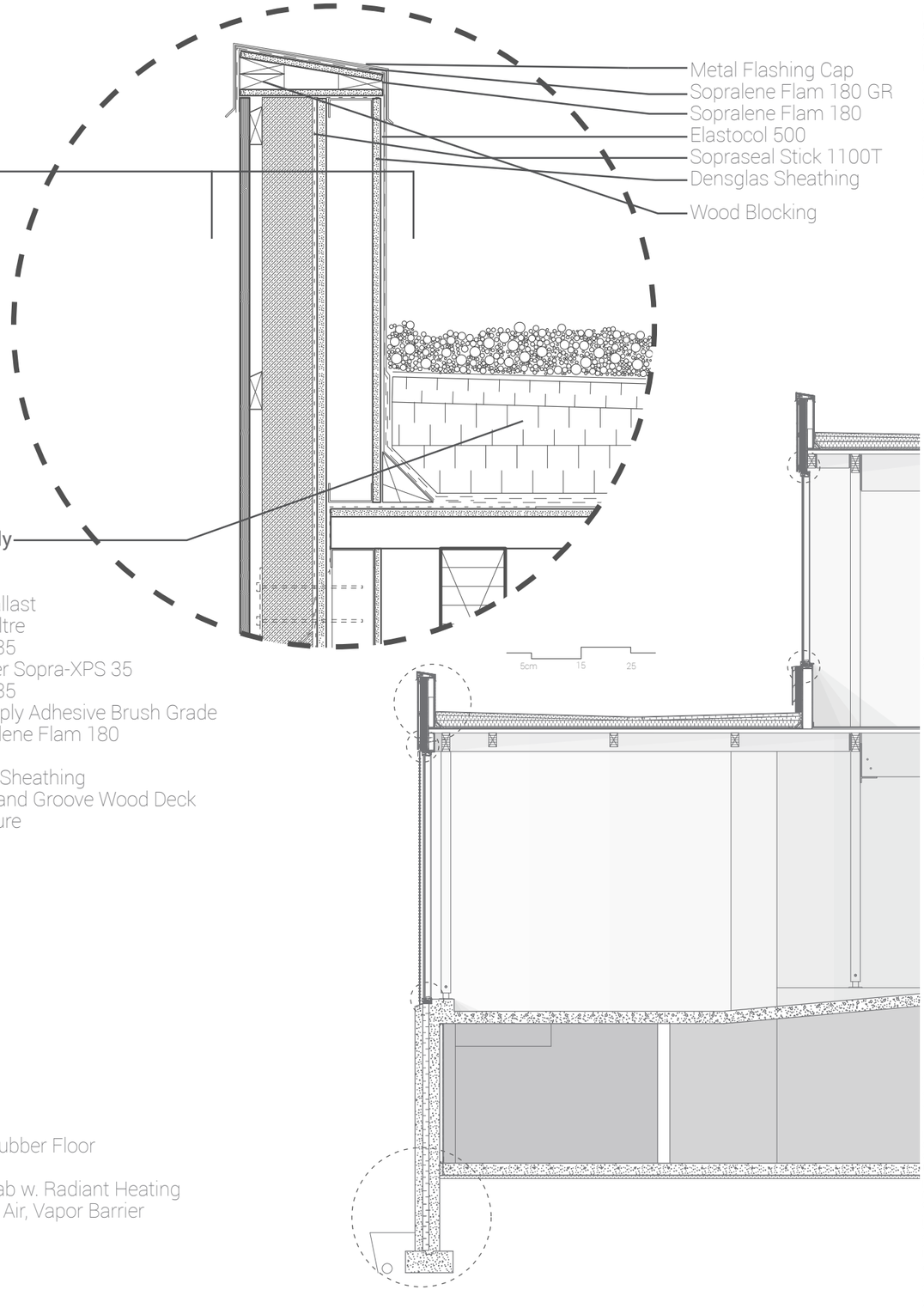




WALL, ROOF & FOUNDATION ASSEMBLIES

Roof approximate R-Value: R 31 - R 50 (due to slope)[8]
Wall approximate R-Value: R 24 (4″ PIC)[8]
Foundation approximate R-Value: R 20 (4″ XPS)[9]

The inverted roof assembly is the same for all three roof types, several layers of sloped-to-drain XPS are adhered to the roof membrane. The membrane is two layers heat welded together and to an exterior grade sheathing. The sheathing sits on top of the wood decking and main structure. The green roof, above the filter material would have an additional Sopradrain Eco-Vent, capillary mat, root barrier, and Sopraflor X (a growing medium for extensive green roofs, with low-irrigation and maintenance).[10]

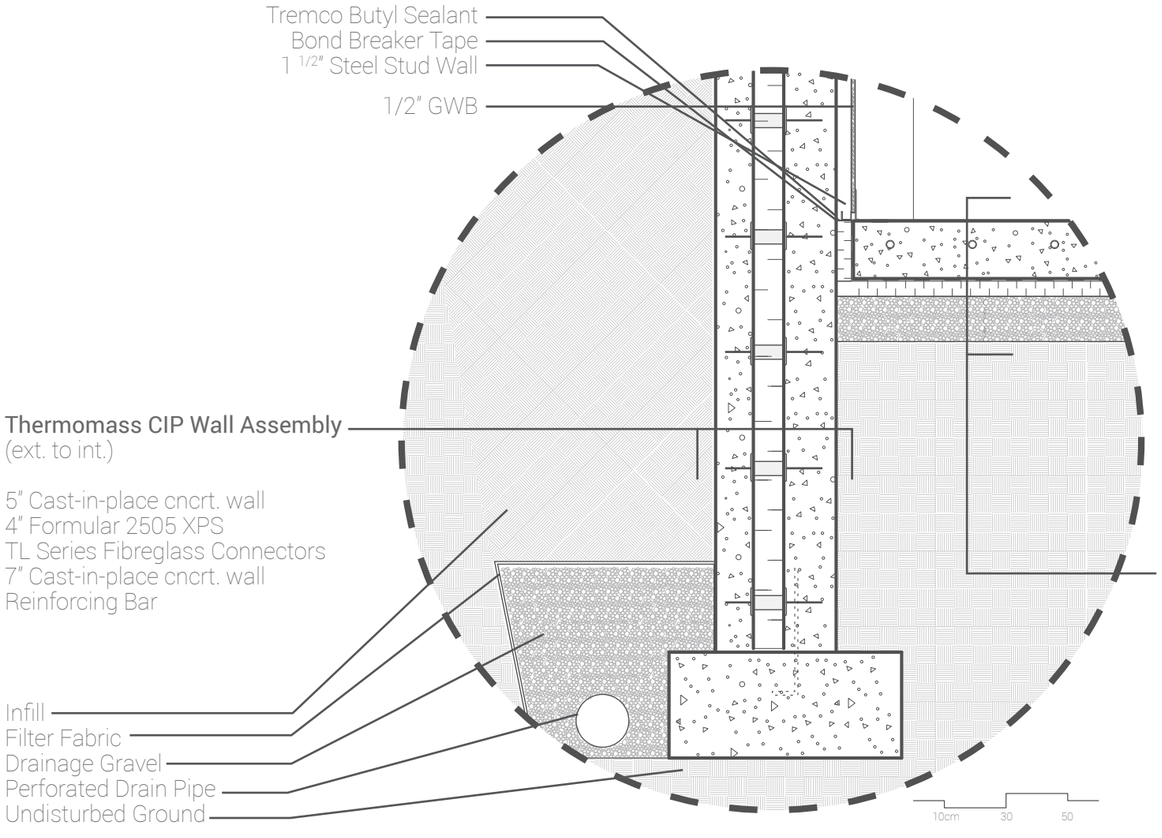


Wood Siding Wall Assembly
(at parapet)

5/8″ Accoya Tongue and Groove Vertical Siding
3/4″ x 2 1/2″ Wood Strapping
4″ Sopra Iso V ALU
Sopraseal LM 200T
Sopraseal Stick 1100T
Sopraseal Stick Primer
5/8″ Densglas Sheathing
3 1/2″ Steel Stud Parapet
3 1/2″ Roxul Batt Insulation
5/8″ Densglas Sheathing
Elastocol 500
1 layer Sopralene Flam 180
1 layer Sopralene Flam 180 GR

Roof Assembly
(ext. to int.)

River Stone Ballast
1 layer Soprafiltre
2″ Sopra-XPS 35
2% sloped layer Sopra-XPS 35
4″ Sopra-XPS 35
1/3″ layer Coldply Adhesive Brush Grade
2 layers Sopralene Flam 180
Elastocol 500
5/8″ Densglas Sheathing
21/2″ Tongue and Groove Wood Deck
Glulam Structure



Thermomass CIP Wall Assembly
(ext. to int.)

5″ Cast-in-place cncrt. wall
4″ Formular 2505 XPS
TL Series Fibreglass Connectors
7″ Cast-in-place cncrt. wall
Reinforcing Bar

Slab Assembly
(int. to ext.)

Norament Satura Rubber Floor
Nora 485 Adhesive
8″ Cast Concrete Slab w. Radiant Heating
10-mil Polyethylene Air, Vapor Barrier
2″ XPS
6″ Crushed Stone

SKIN & ENVELOPE

FENESTRATIONS

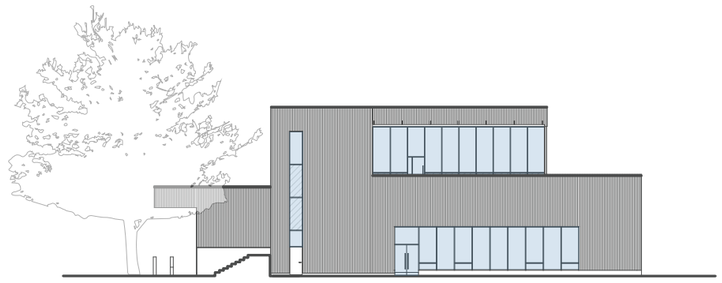
The locations of glazing on the building, were mainly dictated by programme and transparency potential, to connect the programme of the interior to the exterior of the building (particularly the east facade). The windows throughout the building can be classified as window-wall, and in particular places are operable via awning style openings at the bottom of the window. A "standard" window in the building can be considered a fixed aluminum frame window with thermal breaks, triple glazing with a 0.1 low-e coating, and argon fill with a 12.7mm argon space, producing an approximate U-value of 1.51 W/(m^2K).[11]

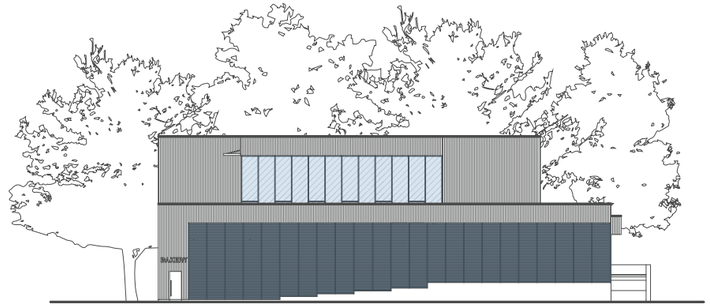
In certain elevations the glazing is treated differently or is shaded to react to the suns orientation and the desired solar gain, and visible transmittance. On the south end of the building, overhanging the F-3 south facade is a small sun shade to deflect summer solar gain and let in winter solar gain. The sun shade is not too wide, and therefore the lower operable parts of these windows are frosted to reduce both the SHGC and VT in these spaces. Since a diffuse light is desired in the resource mezzanine, interior shades can be drawn to reduce glare, but maintain some solar gain on the interior. Adjacent glazed facades are completely frosted to ensure diffuse light entering on the east facade. West facing windows on F-3 are frit with a bird-friendly pattern to reduce incoming solar gain in the early afternoon in the winter months, and late light in the summer months. This is done in conjunction with the mature deciduous trees on the south west portion of the site, acting as shading for the west facade.

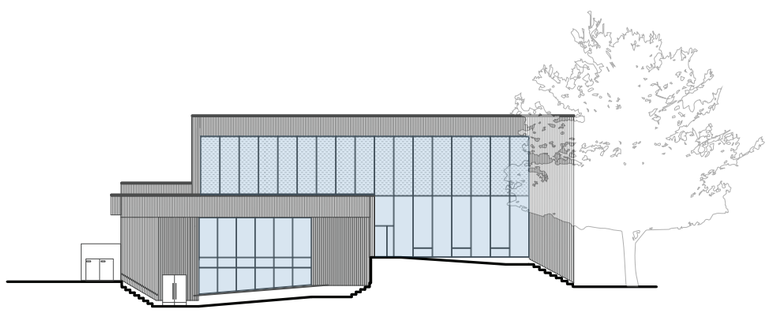
At grade, on the east facade the LED and metal mesh screen also mitigate solar exposure. Although the orientation of the screen is mainly horizontal the density of the slats ensures a reduction of solar gain into the cafe space. Interior blinds on the inside allow for individual operating reduction of glare, as need be.

Frosted Glass

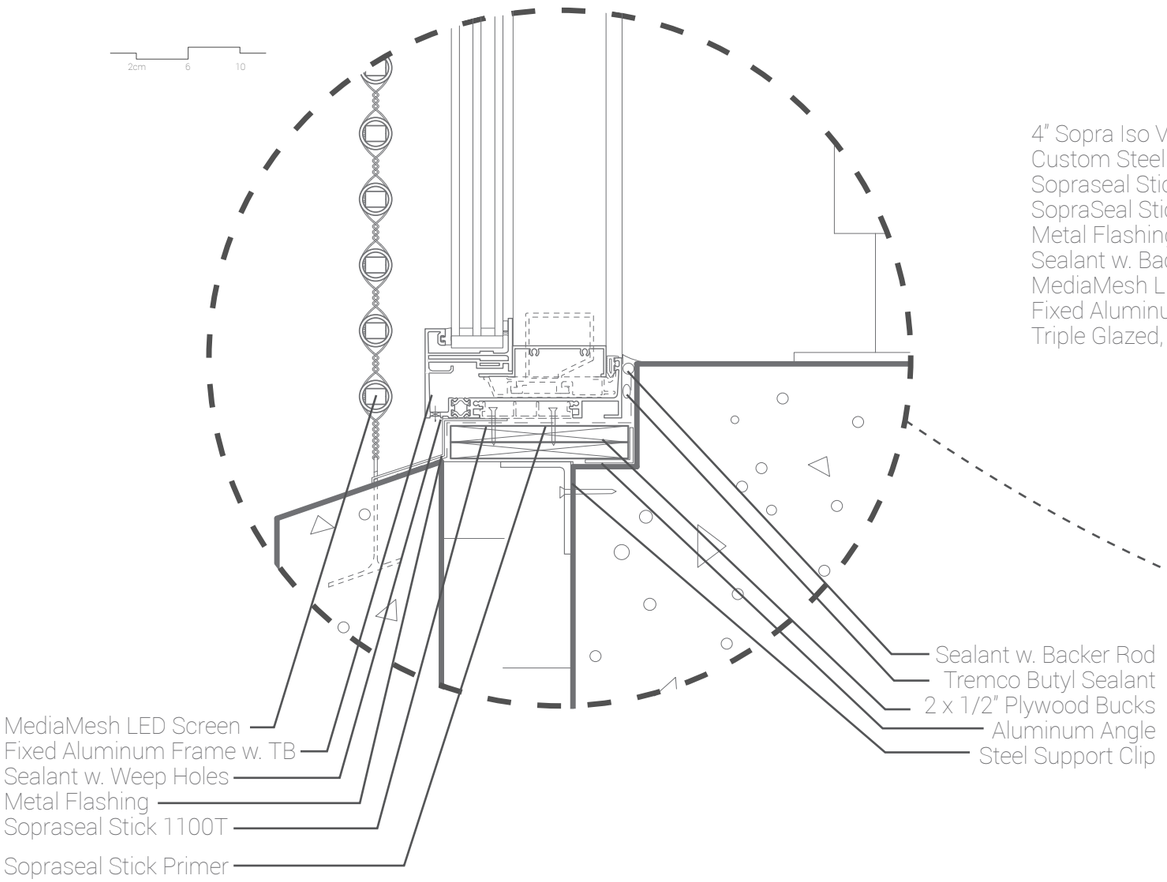
Bird-Friendly Frit

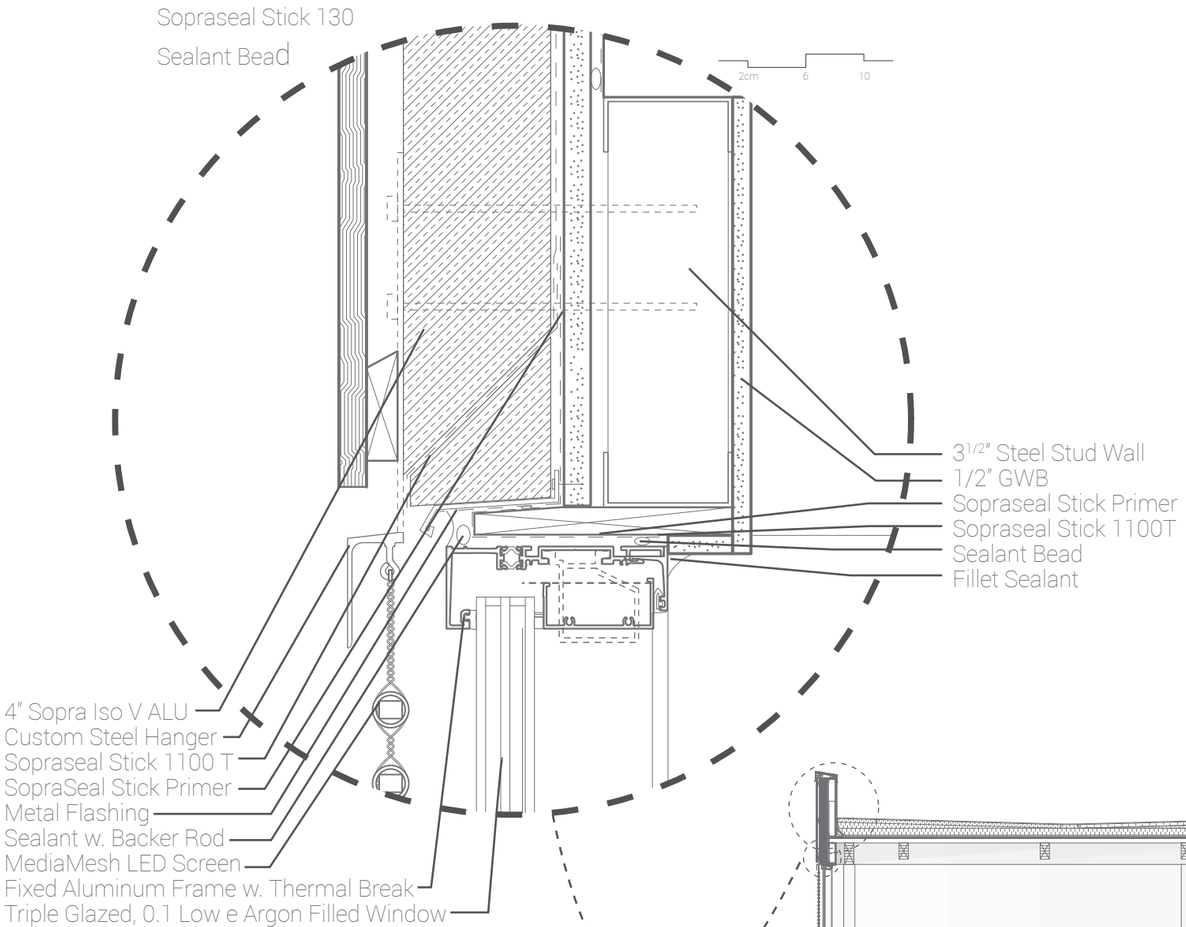


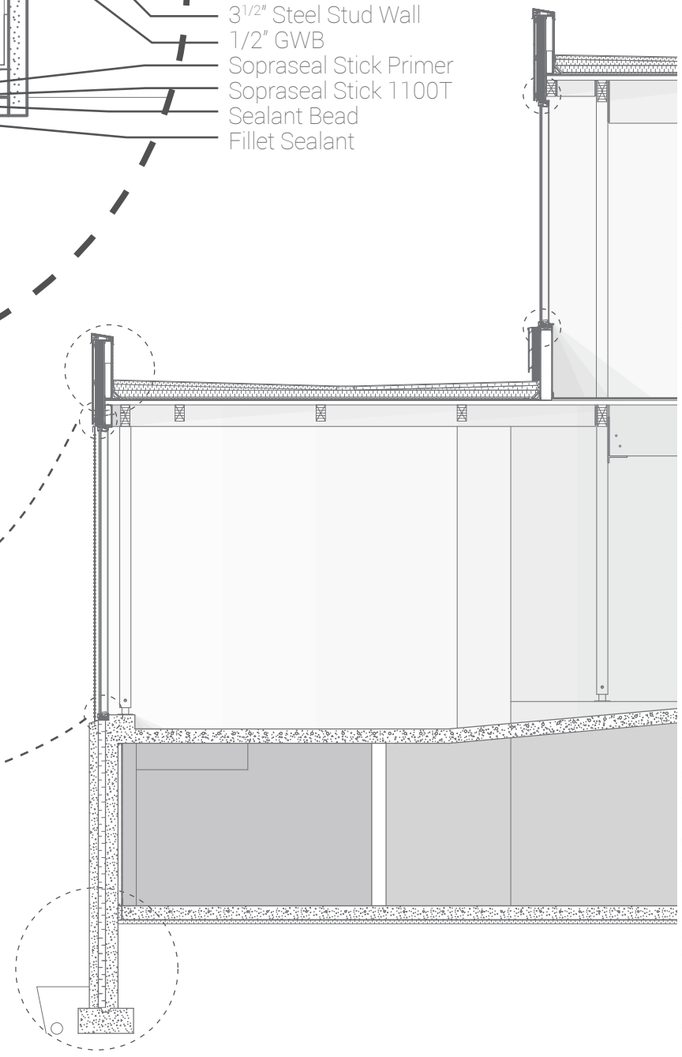




F-1/F-2 HEADER & SILL

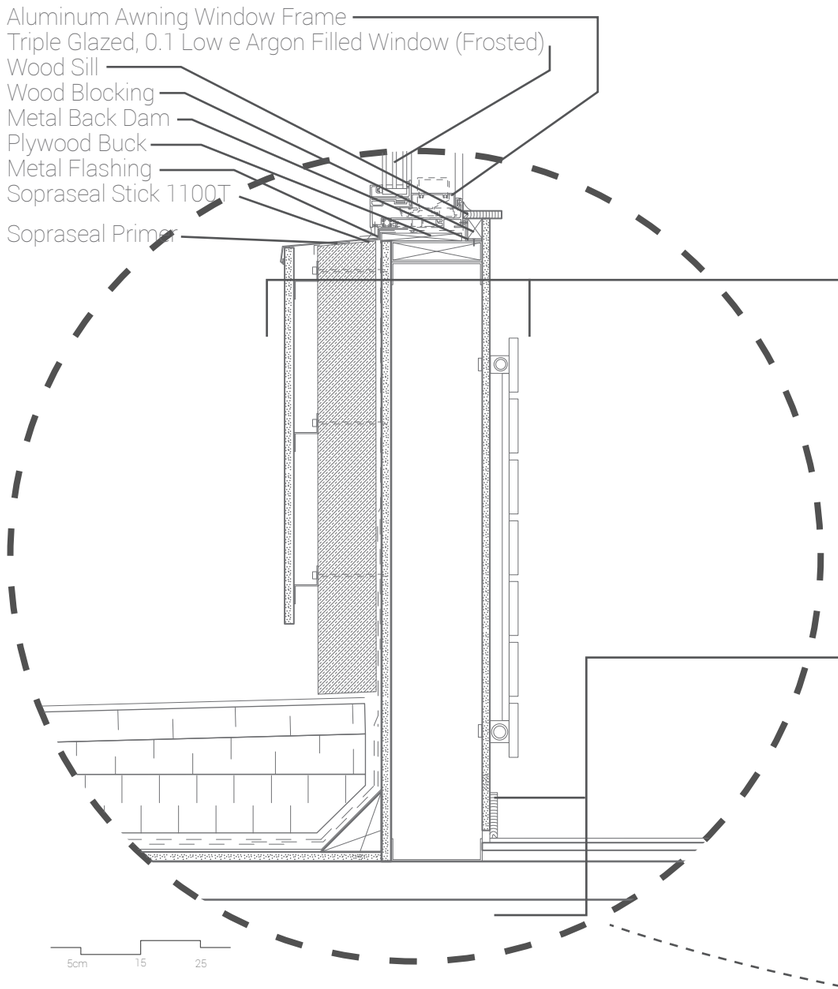






F-3 HEADER & SILL

A cement board cladding is used on F-3 under the windows to decrease installation time, and provide a cost effective, water resistant protective surface for the wall; as it is not visible from the street.

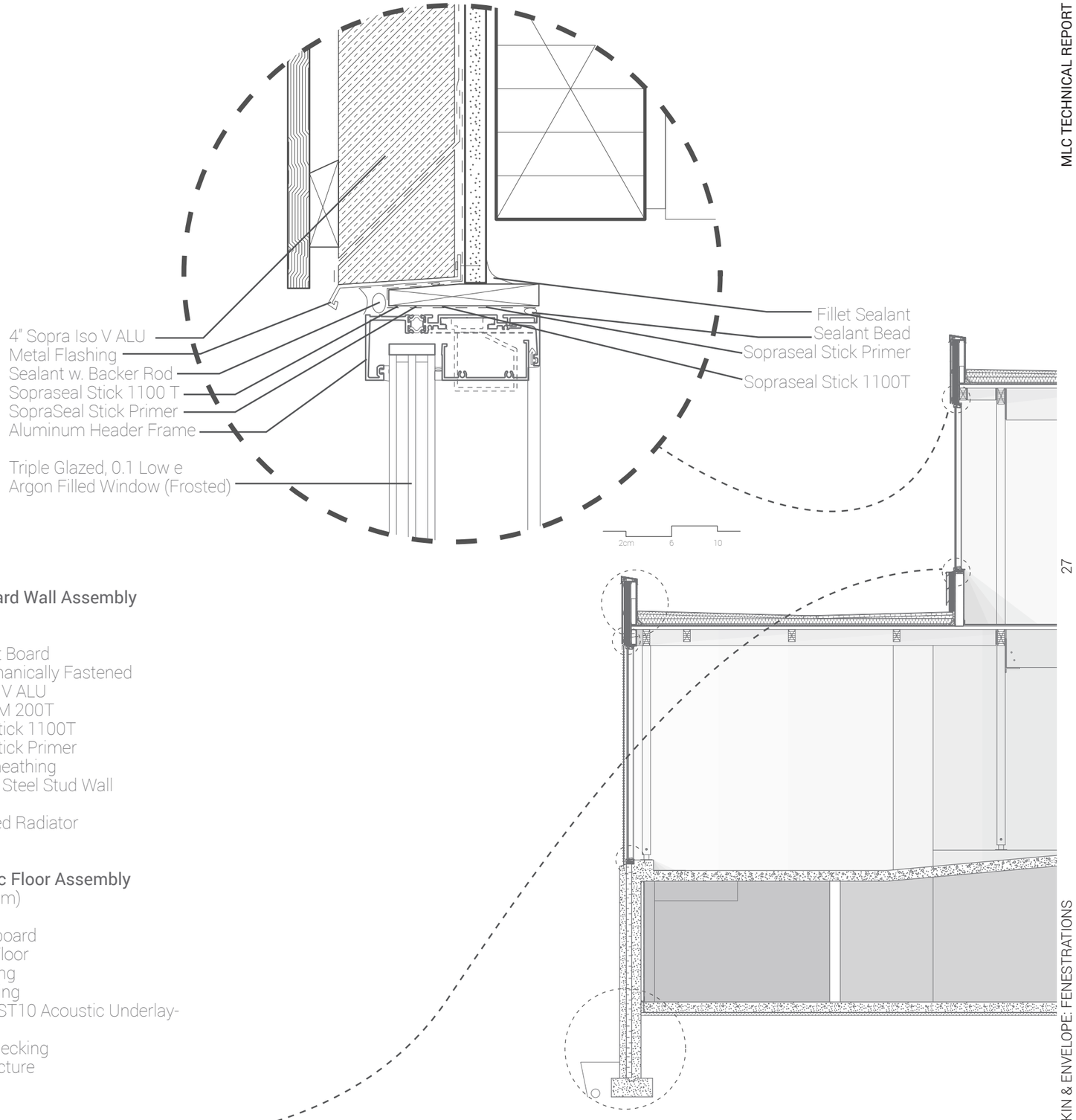


Cement Board Wall Assembly
(ext. to int.)

5/8" Cement Board
Z-clips Mechanically Fastened
4" Sopra Iso V ALU
Sopraseal LM 200T
Sopraseal Stick 1100T
Sopraseal Stick Primer
Densglas Sheathing
6 1/2" Bearing Steel Stud Wall
1/2" GWB
Wall Mounted Radiator

F-3 Acoustic Floor Assembly
(top to bottom)

Wood Baseboard
Hardwood Floor
Foam Backing
OSB Sheathing
Geniemat RST10 Acoustic Underlay-ment
2 1/2" Wood Decking
Glulam Structure



EFFICIENT DESIGN STRATEGIES

PASSIVE INTERIOR AND EXTERIOR SYSTEMS

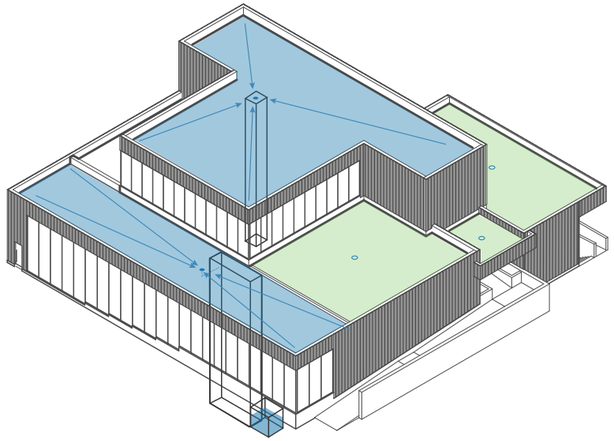
The following six diagrams depict passive systems strategies used to acclimate the interior environment of the building, often incorporating or influenced by exterior systems.

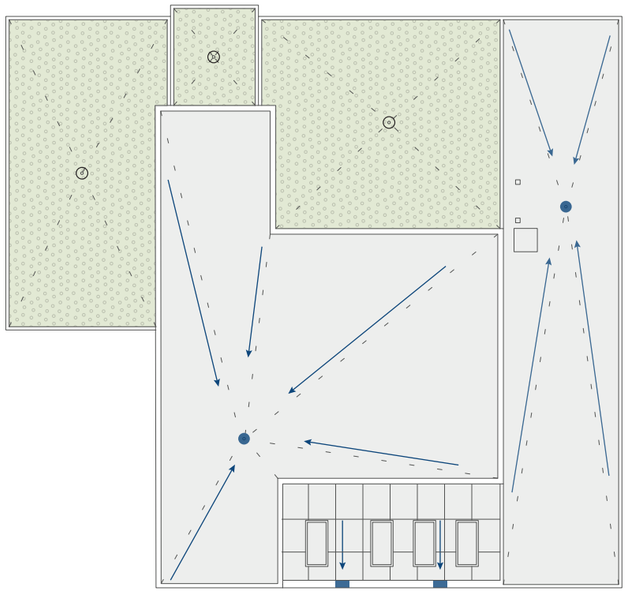
The intent of the building's systems, as a mixed-mode approach, combine both passive and active strategies to generate a comfortable condition within the building year-round. Key features in the building design, which work to support these systems, include two chases located at the NE corner of the theatre, and in the washroom core. These provide enclosed spaces for duct work, plumbing lines, electrical lines, and other systems to run vertically to each floor, and provide direct access to the roof. A mechanical room, located in the basement, serves as the central hub for several of the systems and is accessed through the daycare space.

The artificial lighting, solar gain, passive ventilation, and water management strategies all are a combination of active and passive systems. Several of the components of these strategies work to mitigate exterior systems (sun, wind) for use inside the building according to season and occupancy time during the day.

For example, the solar gain strategy uses several glazing types with varying degrees of visual transmittance and solar heat gain coefficients to generate the desired interior environment throughout the day. The resource mezzanine, as the most glazed portion of the building, has several strategies in place to produce diffuse light. Views out of the building on this floor are thus directed to the large swath of glazing on the west side of the building.

Strategies which are further expanded upon in the technical details provided earlier in this report include water management on the roof (inverted roof systems), as well as the acoustic floor finishes. The details show how the roof assembly functions as a sloped inverted roof, and how the floor assemblies work to reduce foot fall noise, and exhibit the desired floor finish.

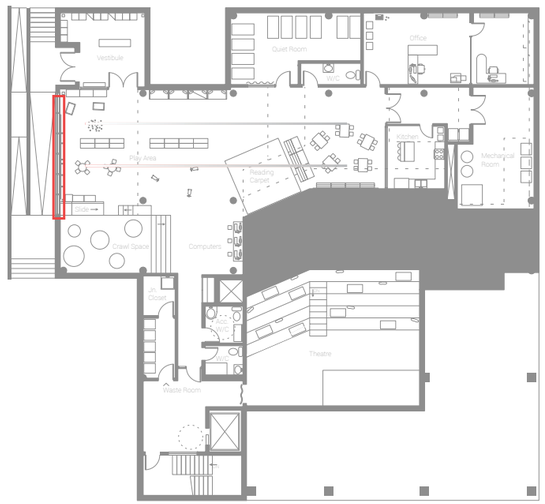




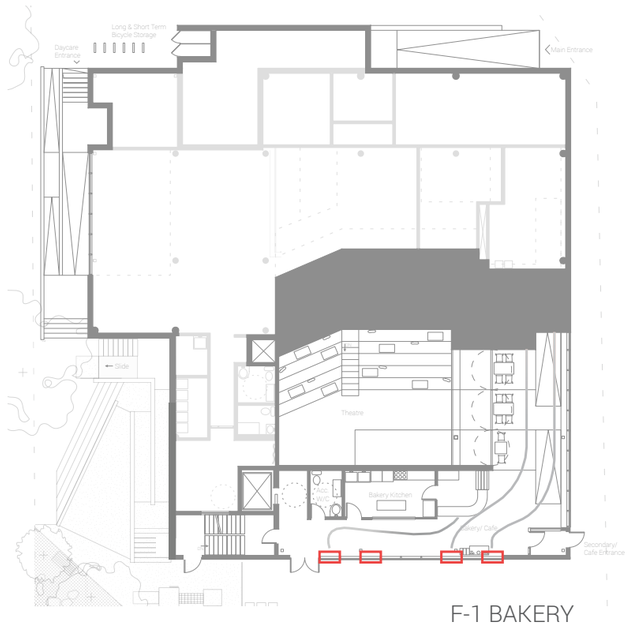
ROOF WATER MANAGEMENT

Grey water collection and water runoff strategy on roof planes. Water runoff is collected, channeled to basement mechanical room, filtered, and used to flush toilets and water plants in the building. Green fill indicates the location of the extensive green roof, the grey fill indicates the river stone ballast, and paving stone ballast roof components.

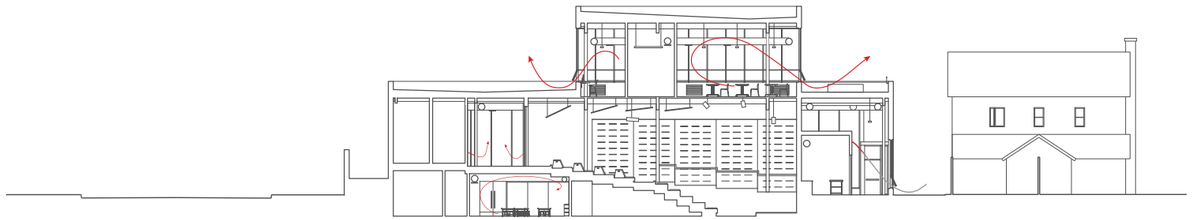
Required Equipment: Drains, Cistern, Water Filtration System



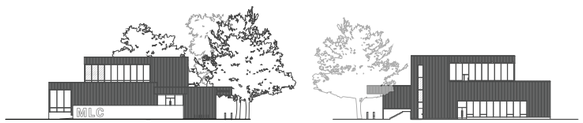
F-0 DAYCARE



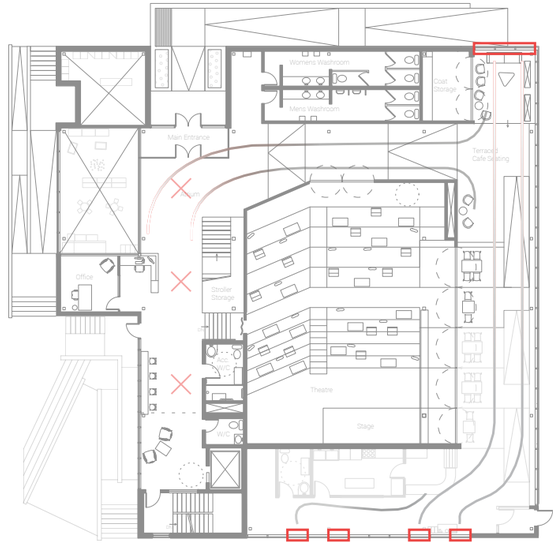
F-1 BAKERY



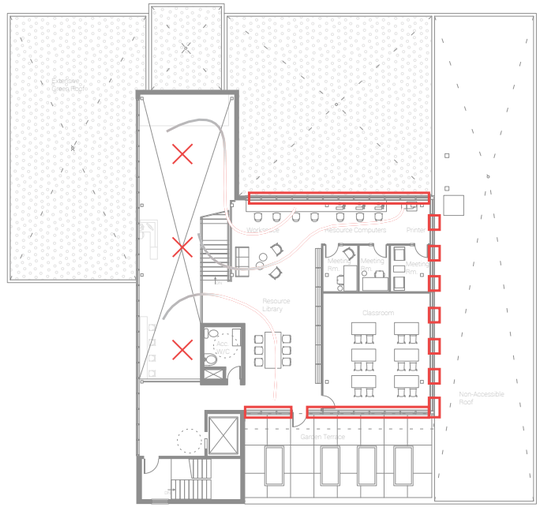
NORTH/SOUTH PASSIVE VENTILATION



Depicted in this section are many air flows as they circulate the building and exit at high points. The objective is to exhaust and cross ventilate spaces by locating operable windows on the mezzanine level, and other high points to ensure naturally rising warm air can rise and exit the building. This works to temper the building, particularly on warmer than average days.



F-2 THEATRE



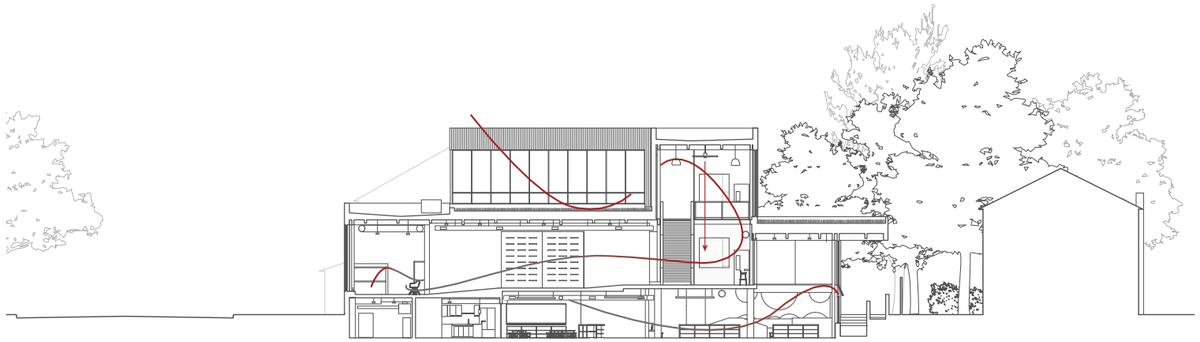
F-3 RESOURCE MEZZANINE

100cm 300 500

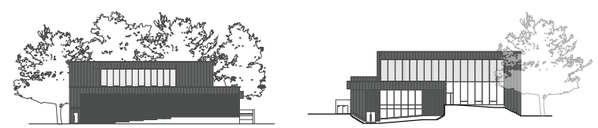
PASSIVE VENTILATION

Passive ventilation utilizes operable windows and fans for cross-ventilation and exhaust of warm air through high parts of the building. This allows for air exchange with the exterior, preventing a build up of toxic off-gassing.

Required Equipment: Awning Windows (indicated in elevations)

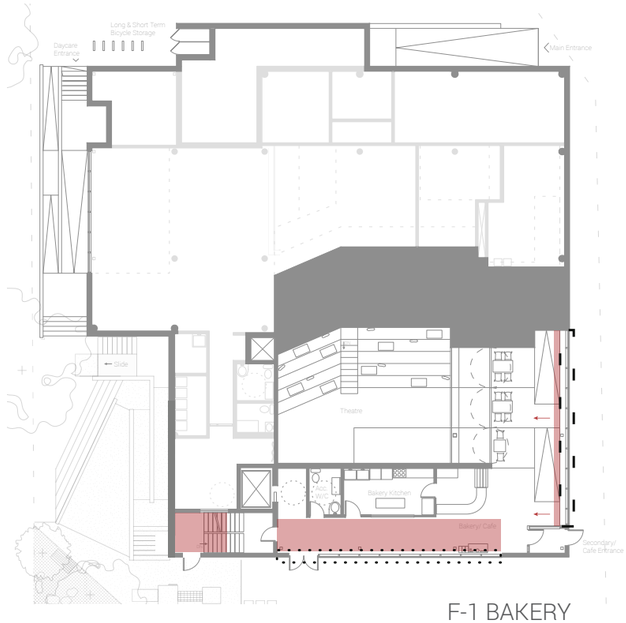


EAST/WEST PASSIVE VENTILATION

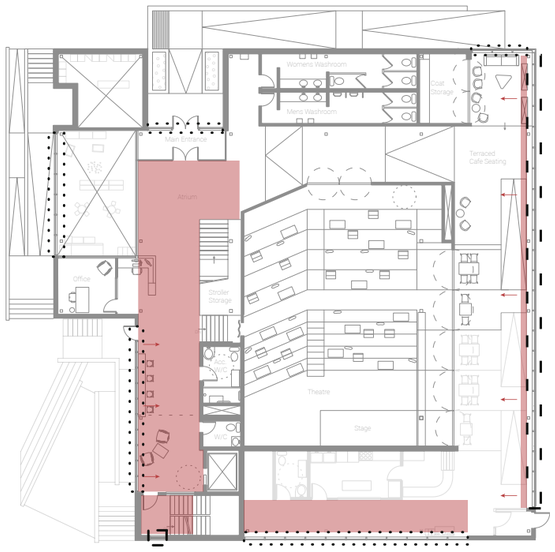


In this section in particular, the strategy is very visible as air flows from the terrace cafe, rising in temperature and flowing out toward the atrium. Here the air rises to the mezzanine level and exhausts through this space. Fans installed at the top of the atrium ensure constant circulation of air in this space. At the basement level, air is expected to be pulled out through operable windows located on the west side, there is little room for cross-ventilation strategies but the hope is that several adjacent operable windows can replicate it to some effect.

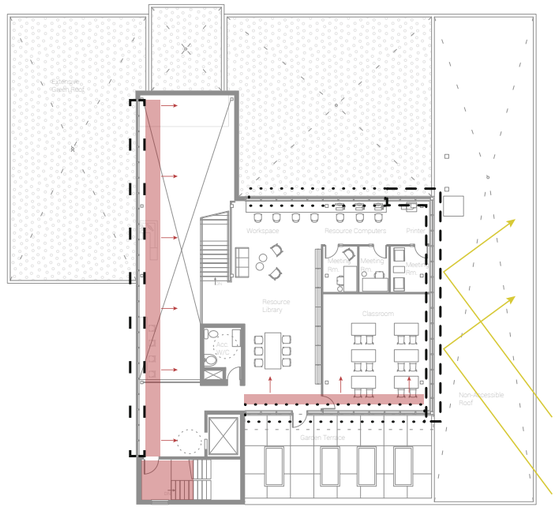
F-0 DAYCARE



F-1 BAKERY



F-2 THEATRE



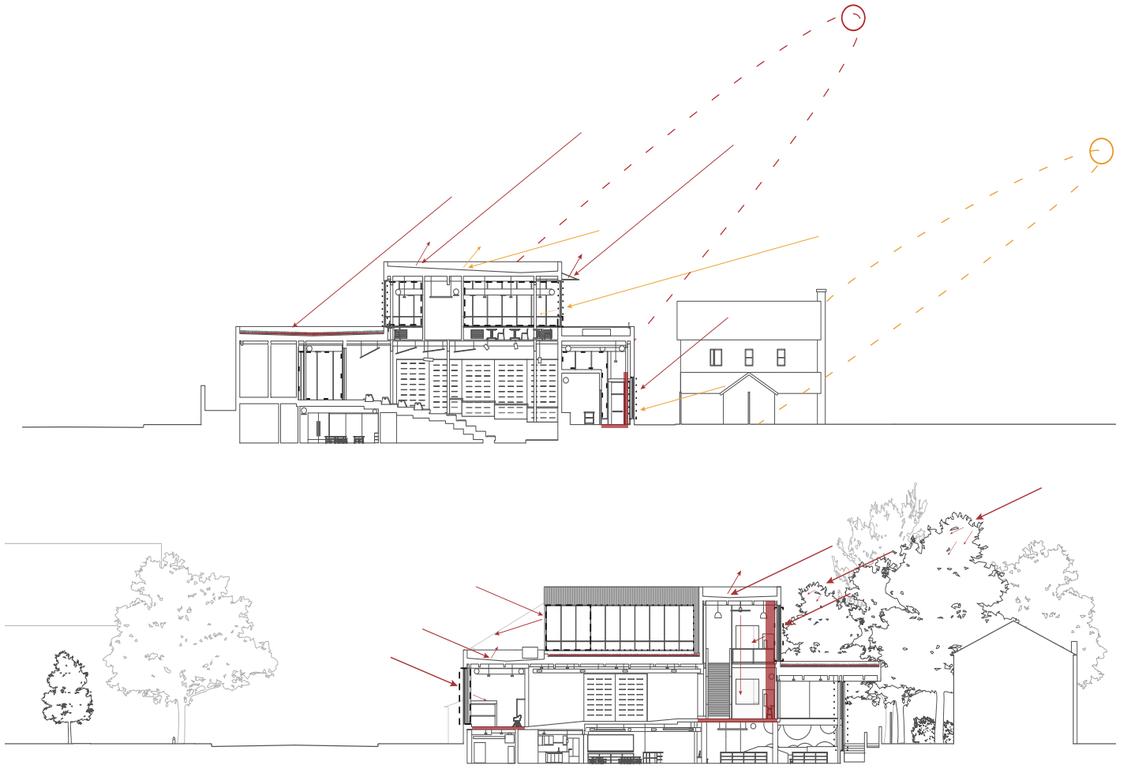
F-3 RESOURCE MEZZANINE

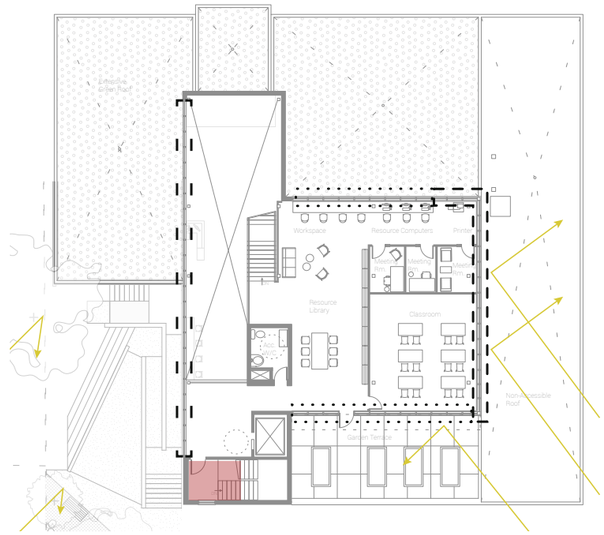
100cm 250 500

PASSIVE SOLAR GAIN

Glazing finishes (indicated in elevations), the multi-storey atrium, and the mass of the finished concrete floors on F-1, and F-2 work to store some solar gain and slowly release it throughout the day.

Required Equipment: (Frosted, Fritted, & Low e) Glazing, Sun Shades, MediaMesh Screen, Fans, Ducts





SG SEASONAL SECTIONS

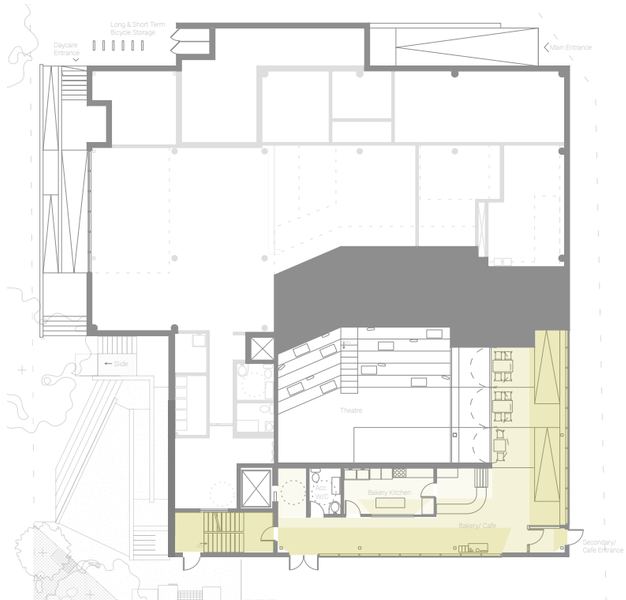
The sections depict the estimated potential for solar gain, as a result of existing design strategies. In addition to the glazing treatments, a sun shade on the south facade rejects solar gain in the summer and allows it to enter the building in the winter (this is shown on the top section as orange for the suns path in the winter, and red in the summer). Keeping the mature trees on the west side of the site help to create privacy between the building and the adjacent house, as well, the trees assist in shading the building from low west light in the evenings. The role of the atrium is substantial when heavy solar gain is desired. The west glazing wall allows for large amounts of solar gain to enter the space which is then absorbed by the mass concrete floor, and circulated via fans to other parts of the building.

Screened (F-1 & 2) or Frosted (F-3)

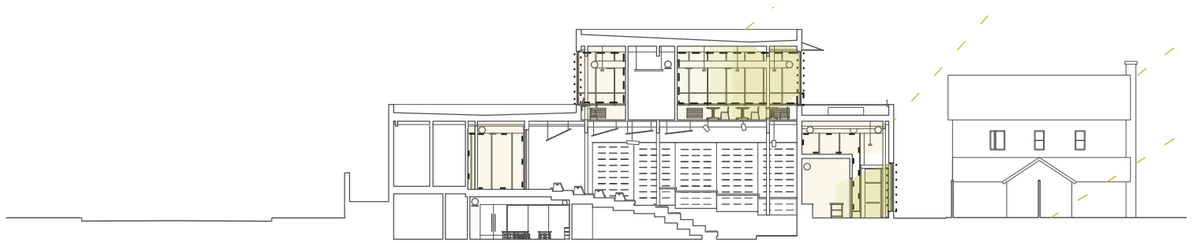
Standard Low-e Argon

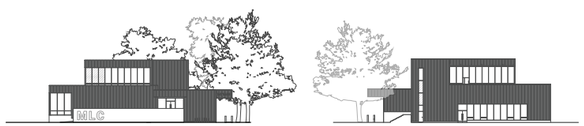
Bird-Friendly Frit Pattern

F-0 DAYCARE



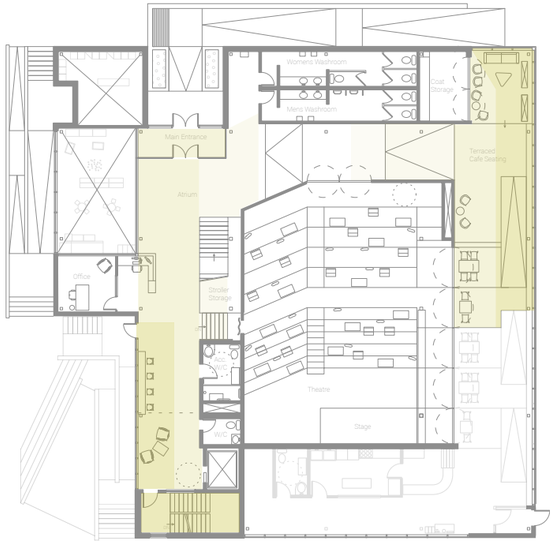
F-1 BAKERY





NORTH/SOUTH DAYLIGHTING

The north/south section depicts the lack of daylighting in the theatre space the best. As well, the mezzanine as a functioning work space with computers and books requires diffuse light. This is obtained through frosted glass on the east side, transparent glazing on the north, and a combination of sun shade, frosted glass and operable interior blinds on the south side.



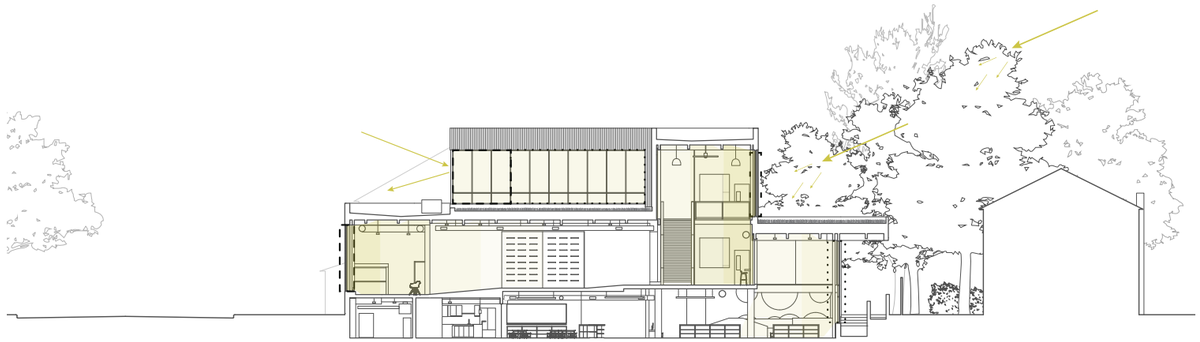
F-2 THEATRE

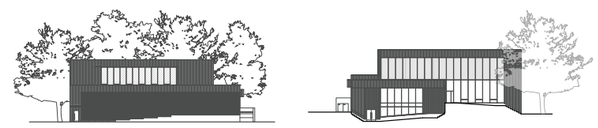
F-3 RESOURCE MEZZANINE

100cm 300 500

DAYLIGHTING

Similar to the solar gain strategy, the daylighting strategy works according to the glazed portions of the building. The building meets the requirements of LEED, as 75% of the regularly occupied spaces are naturally lit.[12] The theatre is intended to be a dark space and so daylighting is rejected from this space. The daycare is heavily artificially lit because of it location below grade. Spaces which are not to be used regularly are thus placed at the edges, while the regularly occupied play space is open and is directed towards a multi-storey glazed wall.

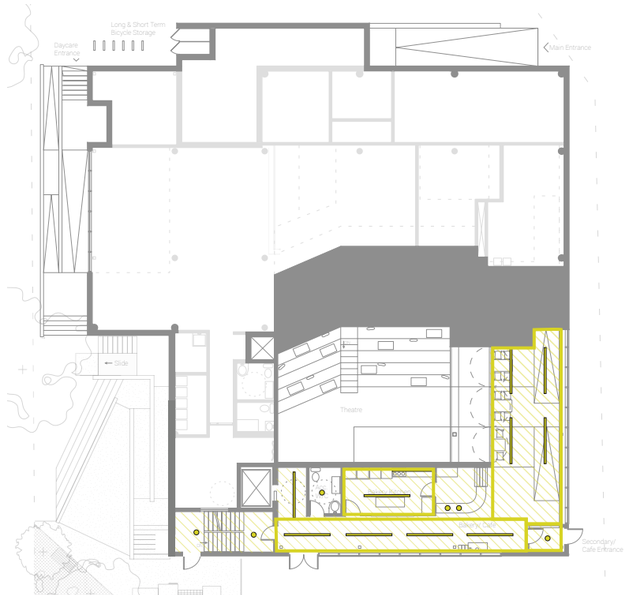




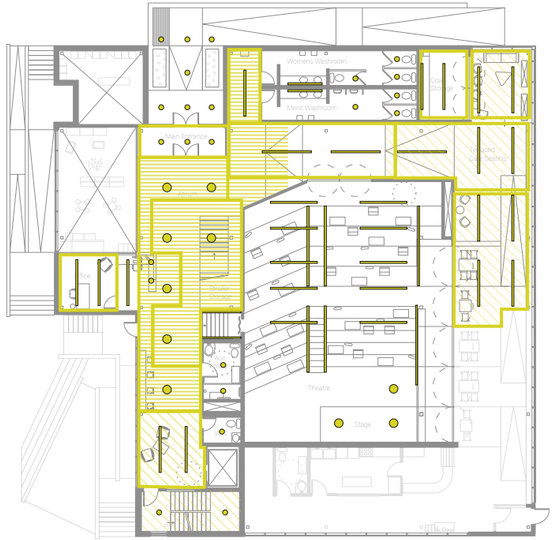
EAST/WEST DAYLIGHTING

The atrium is intended to be a well lit, serving as a welcoming space with views up and out towards the mature trees on the west side of the site. The cafe is also well-lit, and offers views out to Grand Avenue, connecting the interior of the building to this public thoroughfare. The daycare space is mainly artificially lit but on the west side of the space is an open to below space with multi-storey glazing, allowing some light to filter through here.

F-0 DAYCARE



F-1 BAKERY



F-2 THEATRE

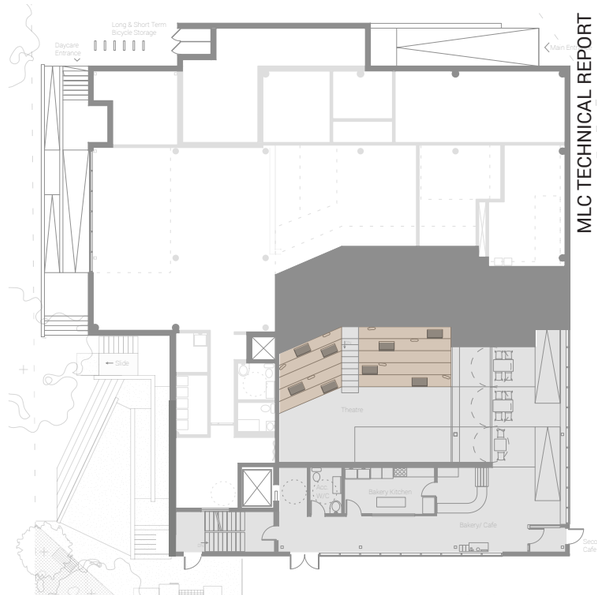
F-3 RESRESOURCE MEZZANINE

ARTIFICAL LIGHTING

The artificial lighting strategy is linked with the passive daylighting strategy to create comfortable environments for the interior spaces, as the programmatic need dictate. Potential for lighting zoning are indicated in the yellow outline, this allows certain lights to be turned off in the case of low occupancy.

Hydro is supplied by the city grid, with membership to Bullfrog Power.[13]

F-0 DAYCARE

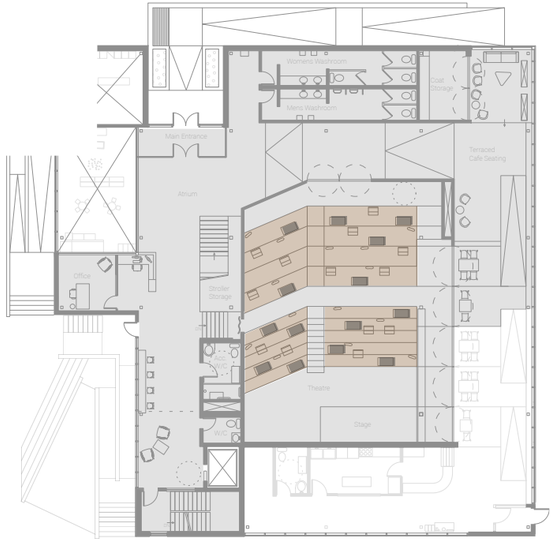


F-1 BAKERY

Norament Satura Rubberized Flooring (Hydra)

Finished Concrete Floor

Light-Coloured Hardwood Floor



F-2 THEATRE

F-3 RESRESOURCE MEZZANINE

FLOOR FINISHES & ACOUSTICS

These diagrams depict the desired floor finish aesthetics, as well as the acoustic strategies for the theatre, daycare, and resource mezzanine. The theatre system consists of both diffusion surfaces, and hard surfaces to ensure proper sound quality, while the floor finishes in the daycare and F-3 reduce footfall reverberation.

Further detailing provided in F-3 Sill Detail and Foundation Detail.

ENVIRONMENTAL SYSTEMS

ACTIVE INTERIOR SYSTEMS

The following three diagrams depict active systems strategies used to acclimate the interior environment of the building. These systems supplement the passive strategies outlined previously and are centralized to the mechanical room.

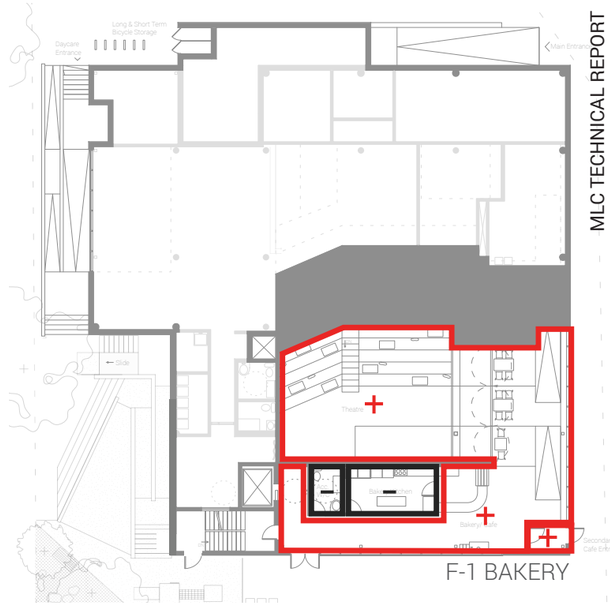
All systems run throughout the building, exposed to below. Sufficient vertical clearance has been provided at each floor for the ducts to hang without interfering with individual comfort. All system lines are to be white in colour, this will work to conceal dust build-up and allow spaces to feel large despite the exposed system lines.

The pressurization diagram is a process diagram used to understand the desired ventilation flows in the building according to programme. The ventilation and heating diagrams are the result of this process.

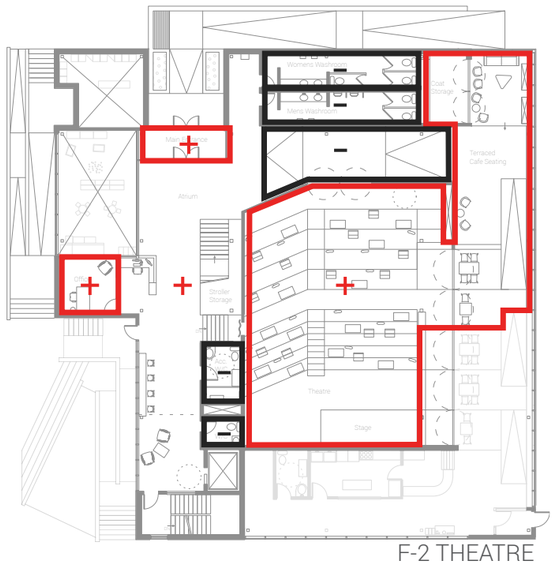
Throughout, the atrium continues to be a key component in air flow in the building, combining passive and active systems to feed into adjacent spaces. Another design strategy which contributes to active system distribution is the structural material palette. The poured concrete floors allow for services to be embedded, and hang from the ceiling and floor, respectively. Where glulam construction is used, the services become wall-mounted or hung, separated from the assembly. Because the building is exterior insulated this allows for services to run through the steel stud, gypsum board finish wall cavity.

Hydro and water systems are connected to the city's supply, and the heating system is run by natural gas boilers. The ventilation duct system supplies the building with proper air exchanges and doubles to distribute air conditioning in the cooling months. Return air ducts direct exhaust air through an HRV in the mechanical room before releasing the air up through the roof. This ensures efficiency in the ventilation system, especially during warming months, so that return air can exchange heat energy with the incoming cool air.

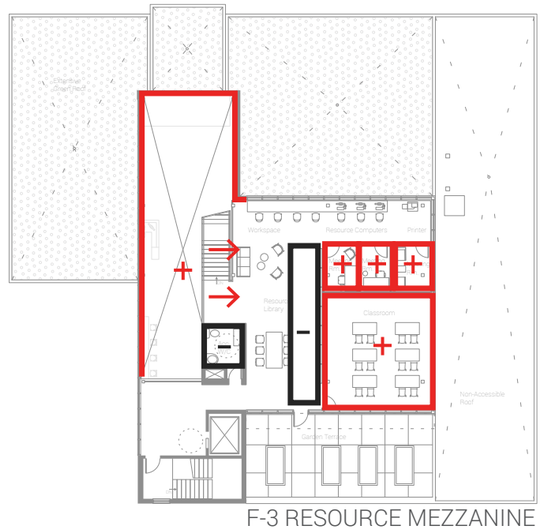
F-0 DAYCARE



F-1 BAKERY



F-2 THEATRE

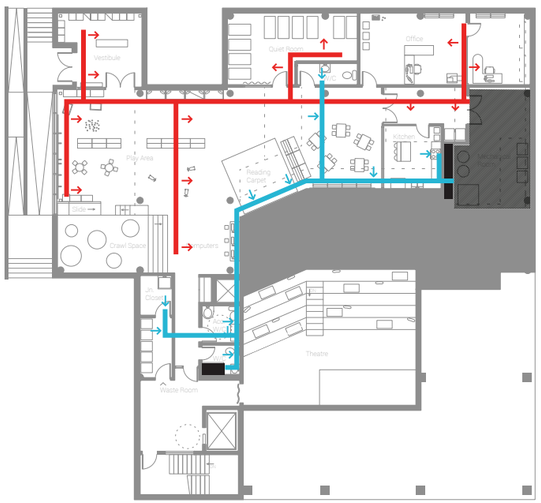


F-3 RESOURCE MEZZANINE

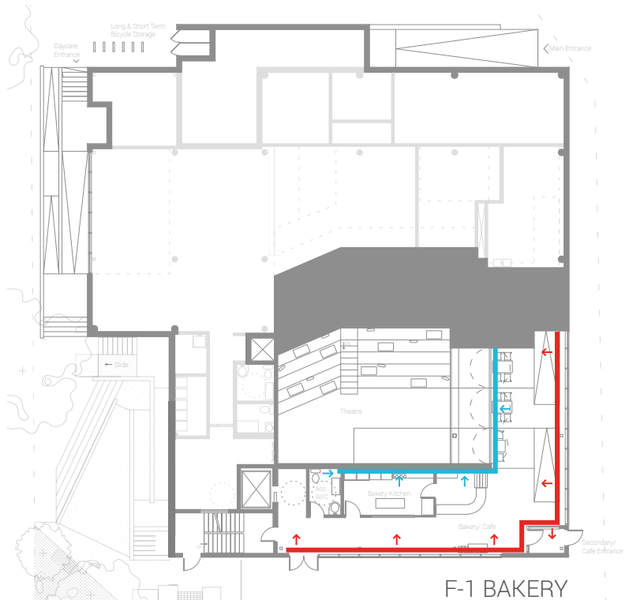
PRESSURIZATION

This is a process diagram used to understand which spaces need positive and negative pressurization according to programmatic necessity. For the most part regularly occupied spaces are positively pressurized while negative pressurization occurs at washrooms and kitchens.

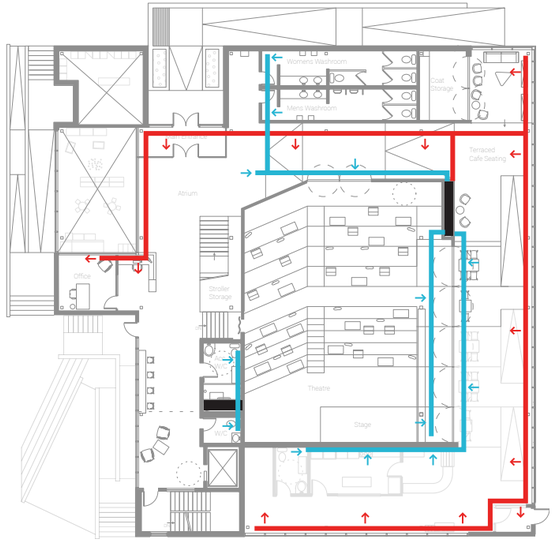
Used to inform placement of ventilation input and return ducts.



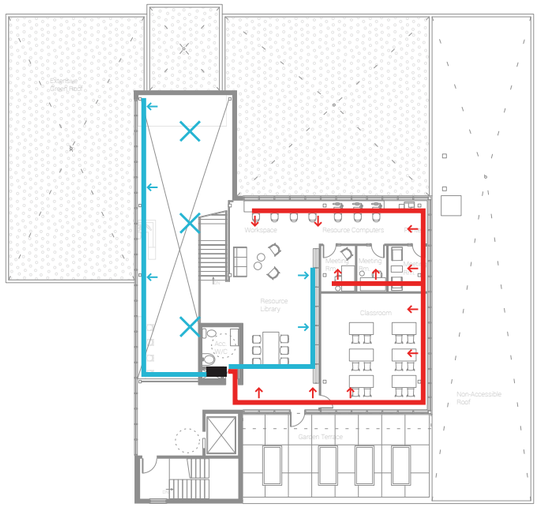
F-0 DAYCARE



F-1 BAKERY



F-2 THEATRE



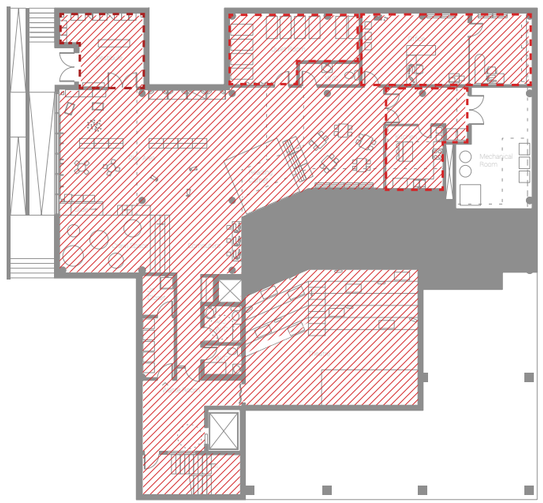
F-3 RESOURCE MEZZANINE

1000m 300 500

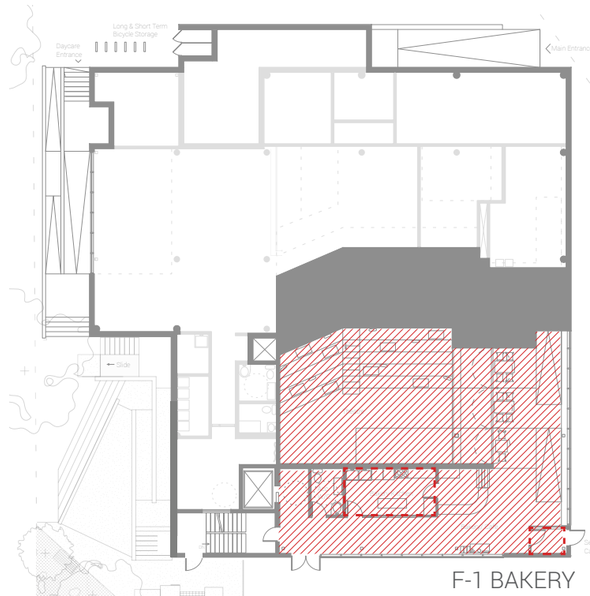
VENTILATION DUCT

Ventilation and required air exchanges[14] are provided by an exposed overhead duct system on all floors, this system also works to provide A/C in the necessary cooling months. Red indicates distribution lines, while blue indicates return ducts which bring air to the mechanical room to be fed through the HRV.

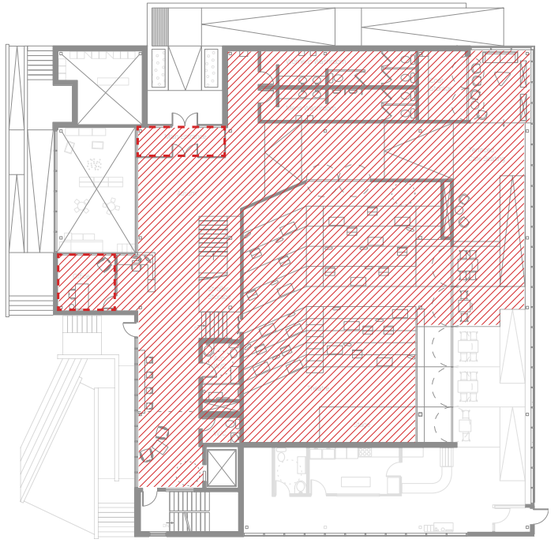
Required Equipment HRV, Metal Ducts & Hangers, A/C unit (on roof)



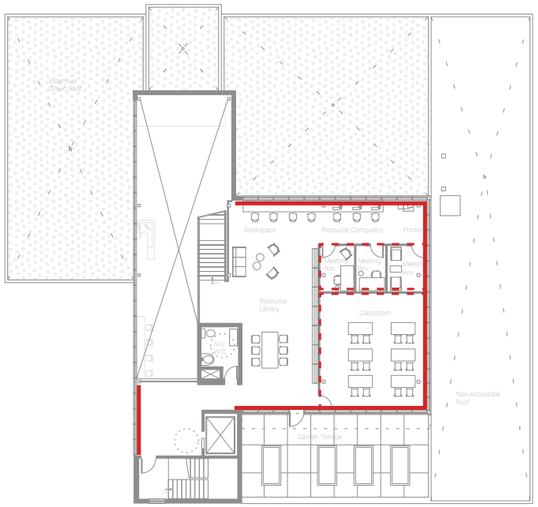
F-0 DAYCARE



F-1 BAKERY



F-2 THEATRE



F-3 RESOURCE MEZZANINE

1000m 300 500

RADIANT HEATING

The heating strategy is an ethylene glycol closed loop system. Radiant in-floor (F-0, F-1, & F-2) with wall mounted radiators (F-3). The red dotted lines indicate potential spaces for segregated thermal zones which may require different temperature controls from the main spaces.

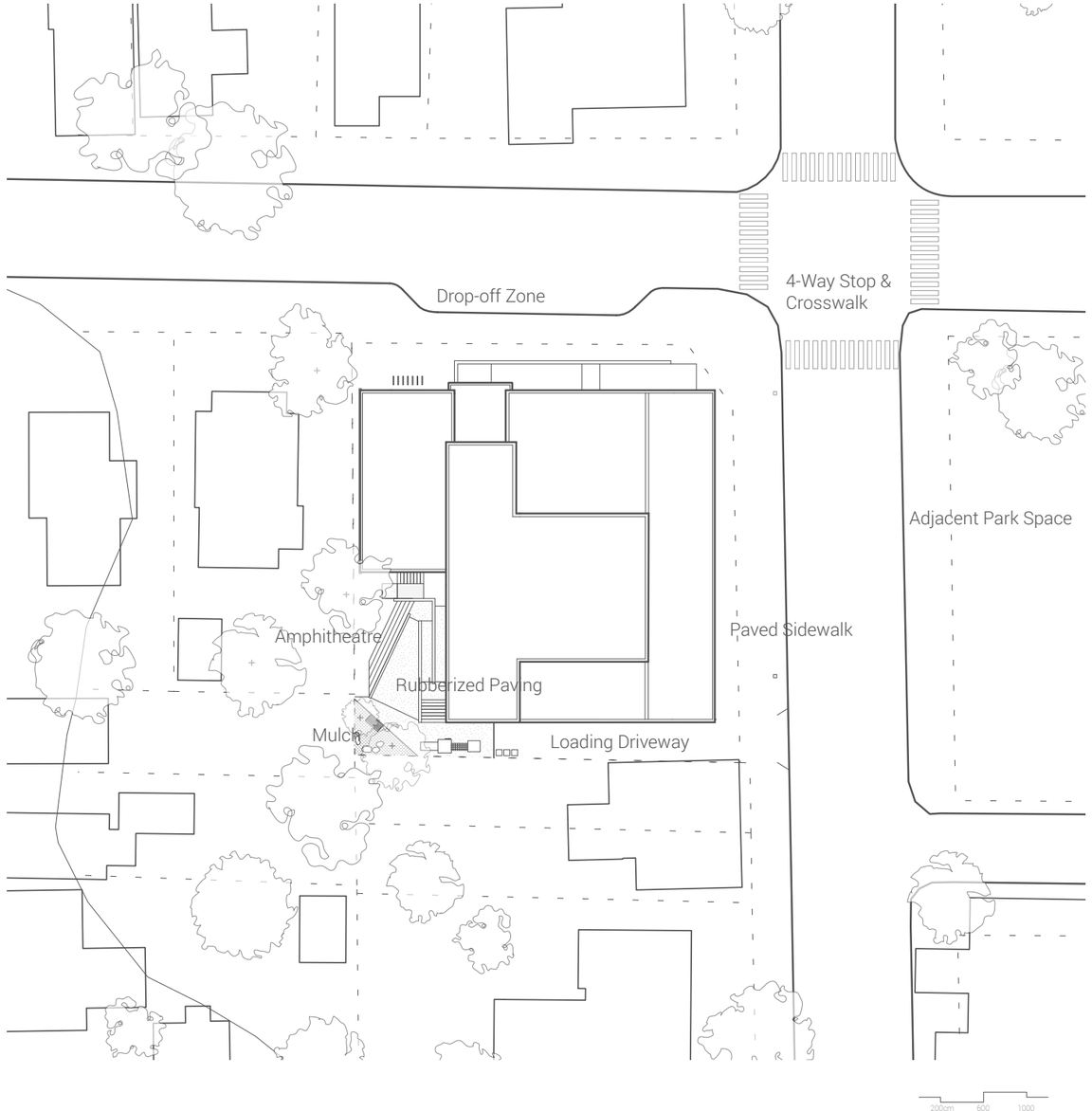
Required Equipment: 2 Natural Gas Boilers (1 main, 1 back-up), radiant heating coils, wall-mounted radiators

SITE STRATEGIES

The building's footprint takes up most of the site, therefore there is only a small backyard on the southwest which is mainly used for the daycare. It is an enclosed space and its multilevel surfaces are finished with rubberized paving to create a safer environment for children to play on. The corner of the yard is covered in mulch with a small bench and rock garden. The larger mature trees which exist already on the site are to be maintained (seen in image below), these will provide shading to the west side of the building. As well, the trees separate the adjacent residential site from the proposed public building. Low shrubbery existing on the site is to be removed. Plantings to be used on the site, and specifically the grasses on the green roof, are to be native to the location.

In front of the building, the site is paved to allow for expanded sidewalk space. The addition of a crosswalk at the intersection of Blair and Grand makes it safer for pedestrians. A drop off zone is added on Blair Road to allow for easy and safe transitions between the daycare and the streetscape. To combat the amount of hardscaping on the site, the building's roof plane works to mitigate water runoff using the green roof and water collection drains.

Image of the existing site and foliage on the west site border, adjacent to housing.



LEED SYSTEMS STRATEGIES

SUSTAINABLE DESIGN

The building complies with the LEED requirements, achieving a score of 77 points, reaching LEED Gold certification. The design takes initiative in creating a socially and environmentally responsible building for the City of Cambridge.

LEED v4 for BD+C: New Construction and Major Renovation

Project Checklist

Media Learning Centre (MLC), Cambridge ON

Date

Y	?	N				Comments
1			Credi 1	Integrative Process	1	Throughout the process the building design integrated and accommodated sustainable strategies as required by LEED
			Location and Transportation		**Possible Points: 16**	
			Credit 1	LEED for Neighborhood Development Location	16	
1			Credit 2	Sensitive Land Protection	1	Option1: The building develops a brownfield lot which was previously a gas station, and is now an undeveloped parking lot
2			Credit 3	High Priority Site	2	Option 3: The building remediates a brownfield site
2			Credit 4	Surrounding Density and Diverse Uses	5	Option 2: From the main entrance of the MLC you can access 8 or more public buildings
5			Credit 5	Access to Quality Transit	5	The MLC will be 550m from the Ainslie Street Terminal which has over 360 weekday trips, and 216 weekend trips, with access to several types of transportation through the system, there are also many stops located even closer to the building
1			Credit 6	Bicycle Facilities	1	Complies with case 1: Commercial and Institutional Projects, long term and short term storage facilities are located within 30 m of the main entrance, an accessible shower is provided in the building
1			Credit 7	Reduced Parking Footprint	1	The project only proposes three permanent parking spots, which are located on the street, and used during the hours of 7-9 and 5-7 as pick-up and drop-off for the daycare
		1	Credit 8	Green Vehicles	1	Allocated parking spaces for the building are located on-street and therefore potential charging stations would be outside the property lines
			Sustainable Sites		**Possible Points: 10**	
Y			Prereq 1	Construction Activity Pollution Prevention	Required	
1			Credit 1	Site Assessment	1	Site assessment completed at the beginning of the project, influenced building and site design
2			Credit 2	Site Development--Protect or Restore Habitat	2	Option 1: Native vegetation is used, and compacted and previously disturbed soils are restored
1			Credit 3	Open Space	1	The design accounts for outdoor space to take-up 30% of the total site, roof surfaces and parts of the ground surfaces are vegetated to reduce runoff, paving surfaces at the front and back of the building encourage social interaction and recreation
1			Credit 4	Rainwater Management	3	Rainwater is managed on the roof planes and on the site to reduce overal runoff from the site. Water is collected and used within the building to reduce water loads by the site.
2			Credit 5	Heat Island Reduction	2	Roof surfaces are low-slope and high reflectance, white sanded cap sheets and river stone ballast, and a green roof. Large trees and plant-ings shade paved areas in backyard, paving materials have 3-year aged solar reflectance values at 0.28
		1	Credit 6	Light Pollution Reduction	1	Although street lights are changed to emit light downwards, the use of an LED screen on the site makes this requirement unattainable
			Water Efficiency		**Possible Points: 11**	
Y			Prereq 1	Outdoor Water Use Reduction	Required	
Y			Prereq 2	Indoor Water Use Reduction	Required	
Y			Prereq 3	Building-Level Water Metering	Required	
2			Credit 1	Outdoor Water Use Reduction	2	Option 1: No irrigation required for exterior vegetation
4			Credit 2	Indoor Water Use Reduction	6	Low flow fixtures and appliances are used throughout the building with a 40% overall reduction, water is collected on site and used for flushing toilets
		2	Credit 3	Cooling Tower Water Use	2	No cooling tower in building
1			Credit 4	Water Metering	1	Permanent water meters are installed in the building to measure potable water use for the building and site, this is summarized monthly and annually and is shared publicly for the five year period following LEED-certification

			Energy and Atmosphere	**Possible Points:**	**33**	
Y			Prereq 1	Fundamental Commissioning and Verification	Required	
Y			Prereq 2	Minimum Energy Performance	Required	
Y			Prereq 3	Building-Level Energy Metering	Required	
Y			Prereq 4	Fundamental Refrigerant Management	Required	
6			Credit 1	Enhanced Commissioning	6	A commissioning agent not on the project team has completed all steps in the required process, including providing an ongoing comission-ing plan, as well as comissioning the building envelope for energy, water, indoor environmental quality and durability compliant with ASHRAE
18			Credit 2	Optimize Energy Performance	18	The building complies with ASHRAE 50% Advanced Energy Design Guides, and used the energy modelling path to ensure complete energy reduction
1			Credit 3	Advanced Energy Metering	1	Advanced energy metering is used and included hourly use, energy consumption and demand,
1			Credit 4	Demand Response	2	Infrastructure is provided in the building to take advantage of a demand response plan when one becomes avaliable
		3	Credit 5	Renewable Energy Production	3	No renewable energy is produced onsite
1			Credit 6	Enhanced Refrigerant Management	1	The project does uses refrigerants with an ozone depletion potential (ODP) of zero and a global warming potential (GWP) of less than 50
2			Credit 7	Green Power and Carbon Offsets	2	The project has membership with Bullfrog Power, the building purchases 100% of the building's annual energy from this "source"

			Materials and Resources	**Possible Points:**	**13**	
Y			Prereq 1	Storage and Collection of Recyclables	Required	
Y			Prereq 2	Construction and Demolition Waste Management Planning	Required	
3			Credit 1	Building Life-Cycle Impact Reduction	5	After completion a life cycle assessment of the structure and enclosure, showing a minimum of 10% reduction in at least three of six impact categories, including global warming potential, ozone depletion, and depletion of non-renewable energy sources is completed
2			Credit 2	Building Product Disclosure and Optimization - Environmental Product Declarations	2	The project has at least 20 permanently installed building materials, from at least 5 different manufacturers, the use of products showing a reduction in environmental impact for at least 50% of the permanently installed materials
2			Credit 3	Building Product Disclosure and Optimization - Sourcing of Raw Materials	2	Building materials used are from manufacturers with a commitment to sustainable extraction practices, materials used include bio-based products, FSC certified lumber, salvaged or reused, or have some recycled content
1			Credit 4	Building Product Disclosure and Optimization - Material Ingredients	2	For at least 20 of the permanently installed building materials have health product declarations and chemical compositions are supplied
1			Credit 5	Construction and Demolition Waste Management	2	The project diverts 50% of construction waste in at least three waste streams

			Indoor Environmental Quality	**Possible Points:**	**16**	
Y			Prereq 1	Minimum Indoor Air Quality Performance	Required	
Y			Prereq 2	Environmental Tobacco Smoke Control	Required	
2			Credit 1	Enhanced Indoor Air Quality Strategies	2	Grates and mats are installed at all entrances, aire exhaust system uses negative pressurization in certain zones, outdoor air entry points have filters with a MERV rating of 13
2			Credit 2	Low-Emitting Materials	3	Materials with low VOC are used in the project
		1	Credit 3	Construction Indoor Air Quality Management Plan	1	
1			Credit 4	Indoor Air Quality Assessment	2	After construction is completed and cleaned change all filtration media and perform a whole-building flush-out using at least 14000 cubic feet of outside air per gross square foot of floor area
1			Credit 5	Thermal Comfort	1	HVAC system meets the requirements as determined by ASHRAE Standard 55-2010
2			Credit 6	Interior Lighting	2	Interior lighting controls are given to at least 90% of occupant spaces and there are multi-zone controls, light fixtures and placement meet at least four of the light quality measures
2			Credit 7	Daylight	3	Daylighting is provided in most regularly occupied spaces
1			Credit 8	Quality Views	1	Over 75% of regularly occupied spaces are provided with a view outdoors or to the interior atrium
1			Credit 9	Acoustic Performance	1	The building meets the acoustic requirements of LEED, ensuring a reduction of background noise, sound isolation, reverberation time, and sound reinforcing and masking

			Innovation	**Possible Points:**	**6**	
2			Credit 1	Innovation	5	The building design utilizes mixed-mode strategies to make an efficient, sustainable building
1			Credit 2	LEED Accredited Professional	1	Supervised by Terri Meyer Boake

			Regional Priority	**Possible Points:**	**4**	
			Credit 1	Regional Priority: Specific Credit	1	
			Credit 2	Regional Priority: Specific Credit	1	
			Credit 3	Regional Priority: Specific Credit	1	
			Credit 4	Regional Priority: Specific Credit	1	

77			**Total**	**Possible Points:**	**110**

Certified 40 to 49 points Silver 50 to 59 points Gold 60 to 79 points Platinum 80 to 110

CONCLUDING COMMENTS

The MLC is a sustainable building, both in the environmental and social sense. The building works with the community to provide much needed immigrant services space downtown while amalgamating this with a community hub in the form a daycare, theatre, and bakery combo. The building itself is an environmentally conscious design, incorporating mixed-mode, passive and active strategies to create welcoming, and comfortable spaces for the visitors to occupy. Care has been taken to consider all aspects of the design to create a non-discriminate space at the scale of the surrounding context, which is welcoming to all members of the community.

ENDNOTES

1. "Odger," *IKEA*, December 6 2017, <http://www.ikea.com/ca/en/catalog/products/00360002/>

2. "Setu Chair," *Herman Miller*, <http://store.hermanmiller.com/office/office-chairs/setu-multipurpose-chair/7328.html?lang=en_US>

3. "What is LEED? – Location and Transportation," *Green Building Elements*, September 3, 2014, <https://greenbuildingelements.com/2014/09/03/leed-location-and-transportation/>

4. Lionel Lemay, "Understanding the LEED Credit for Recycled Content," *Concrete in Focus*, National Ready Mixed Concrete Association, 2004. Print.

5. "AITC Beam Capacity Tables," *Beam Capacity Tables Technical Information*, American Institute of Timber Construction, 2007, <http://www.aitc-glulam.org/capacity.asp>

6. "Thermomass System CIP," *Thermomass*, <https://thermomass.com/products/system-cip/>

7. Thermomass Insulated Concrete, [video]. December 7, 2017, from <https://www.youtube.com/watch?v=tqiyt3GsMg8>

8. *Soprema*, Soprema, <http://www.soprema.ca/>

9. "Insulation Products: Extruded Polystyrene Insulation," *Thermomass*, 2017, <http://thermomass.com products/insulation-products/>

10. "Sopra XPS Sopranature," *Soprema*, <http://www.soprema.ca/system/sopra-xps-sopranature-1045/>

11. "Table 4: U-Factors for Various Fenestration Products in W/(m^2*K)," *ASHRAE Fundamentals 2009*, ASHRAE Inc., 2009. Print.

12. Dawn Killough, "What is LEED? – Indoor Environmental Quality," Green Building Elements, 2014, < https:/greenbuildingelements.com/2014/10/21/leed-indoor-environmental-quality/>

13. *Bullfrog Power*, Bullfrog Power, <https://www.bullfrogpower.com/>