The Mosaic Centre for Conscious Community and Commerce

Design Development Report

27 September 2013

mosaic
CENTRE

MANASC ISAAC

Design Development Report

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View looking northwest

Interior view of childcare space

1 Project Overview

1.0 PROJECT DESCRIPTION

The Mosaic Centre For Conscious Community and Commerce is going to more than an office building.

This new, 30,000 ft^2 building will be located at the threshold of a commercial strip and the emerging Edmonton community of Summerside. It will house the Mosaic Family of Companies, providing its staff not only an office, but important amenities including a child-care facility, wellness centre, lounge areas and game rooms, and even a restaurant. One of the primary goals is to create a Net zero Commercial building- a building that will generate as much energy on site as it will consume in a year. That isn't the only green goal- this building hopes to be the first Living Building Challenge petal certified building in Alberta!

The Mosaic Centre for Concious Community and Commerce is to create a bright, comfortable, environmentally sustainable space that promotes a healthy collaborative work environment which resonates with the unique ethos of its occupants that is replicable and inspiring for all.

We'll "Awesomize" it.

1.1 SITE CONTEXT

The Mosaic Centre for Conscious Community and Commerce will be located in a commercial/industrial zone adjacent to a burgeoning community in South Edmonton on the corner of 91 Street and Savaryn Drive. The site is in the Ellerslie Industrial Zone and is adjacent to the newly emerging Summerside Community.

In observing current street patterns it is anticipated there will be a connection from 91 Street to 41 Avenue to the south and Savaryn Road will eventually lead to further commercial/residential development and may connect to 101 Street to the west. There are existing multi-use trails immediately west and east of the site, hugging the boundary of the residential community. There is an existing storm water pond to the south east of the site.

Typically, key determinates of site planning are dominated by vehicular considerations such as parking demands and maintenance requirements. Primary to this site is solar acccess. Thorough anaylysis of present and future solar exposure was undertaken to site the building. We have taken special efforts to implement Low Impact Development (LID), blurring the pedestrian and vehicular zones, to create a multi-dimensional public realm that is very atypical for our built environment. Vehicular access to the site will come from the southeast, and parking requirements will be facilitated on the north and east

Site as seen on Google Maps showing the Ellerslie area

side of the side (behind and beside the building).

A community space will be situated on the south west corner of the site, in the form of a public park/plaza. This will encourage the local community to come and use the public programmes operated inside the building.

In particular, the design of the tree canopy will define space and contribute to both human comfort and ecological function. While the landscaping must respond to parking constraints, we have created a more rigorous pattern of trees across the site than usual. These trees will organize and integrate present outdoor functions while accommodating future needs.

It is also anticipated that a future Mosaic building will be created on the site over the next 5–10 years, in alignment with the projected growth of the Mosaic Family of Companies.

1.3 SCOPE/PROGRAM

The Mosaic Centre is intended to house the following programmes:

- Restaurant/ Café with a Juice/coffee bar
- Childcare Centre
- Wellness Centre
- Beehive Open Office Space
- Oil Country Engineering Office Space

During the Design Development phase, some program adjustments were made, including the following:

Removed from functional program

Equipment room was deleted from the Wellness Centre.

Board Room, Breakout Rooms, Team Room and Printer Room were deleted from the Shared Rooms.

Added to Program Area

Reception Area, Board Room, Telecomm Room and Custodial Room were added to the “Beehive”.

Reception Area was added to the Wellness Centre.

Meeting Rooms/Breakout Rooms, Print Room/Copy Centre and Custodial Room were added to OCE.

Sprinkler Room, Equipment/Safety/Site visit Room, Staff Storage/ Locker Room, Server Room, Building Service Room were added to the main floor.

Spaces Combined/Consolidated

Washrooms are shared between “Beehive” and OCE in shared spaces

Data Centre/Server Room and Safety/Site Visit Room were moved from OCE to main floor.

Other Space Alterations

Video Game area in Shared Rooms was increased in size from 20 to 31.4 m2.

Offices (individual) in OCE were reduced in size from 120 to 61.1 m2.

Quiet pods in Shared Rooms were reduced in size from 30 to 12 m2.

Lounge space in Shared Rooms was reduced in size from 100 to 66.4 m2.

Elevator on the main floor was reduced in size from 107 to 67 m2.

Washrooms in Childcare Centre were reduced in size from 90 to 25 m2.

Multipurpoose space in Wellness Centre decreased in size from 180 to 130 m2.

Lockers in Wellness Centre were reduced in size from 40 to 10 m2.

Phase	Date
Construction documents	August to November 1 2013
Tender/Procurement	November to December 2013
Construction	January 2014 mobilization to May 2015
Commissioning	April to May 2015
Occupancy	May 2015

Name Changes

Quiet Pods were named Quiet Nooks in OCE Office Space.

1.4 SCHEDULE

This report completes the Design Development stage of the project.

2 Progress to Date

2.1 VISIONING AND STAKEHOLDER ENGAGEMENT

With the intent of developing the information and consensus necessary to inform the Mosaic Centre building design, the main focus of the Design Development phase has been the engagement of project stakeholders.

STAKEHOLDERS INCLUDE

Mosaic Family of Companies
Oil Country Engineering
Chandos
Clark Engineering
DGE Group Inc.
Fast + Epp
Ferguson
Howell Mayhew Engineering
Integrated Designs
Manasc Isaac Consulting
Metalacon
PICEA
Priority Mechanical
ReNu Building Science
River City Electric
Sol North
Western Archrib
Manasc Isaac Architects

View looking southeast

2.2 DESIGN ASSIST

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Meeting	Dates
Structural Design Assist	
Envelope Design Assist	

2.3 CHALLENGES AND OPPORTUNITIES

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Short section through Collision Space

3 Landscape Design

3.1 SITE INFRASTRUCTURE

- On-site snow storage accommodated in northeast corner of site. Landscaped area (c/w trees and shrubs) removed to accommodate snow storage.
- Rain garden included at southeast corner of site, to address stormwater generated in sunken plaza and parking area along the east site line. The rain garden will be designed to accommodate a maximum depth of standing water of 100mm, to be controlled by a catchbasin tied to local storm sewer. Overflow will be provided to the parking lot area.
- Edible garden has been reconfigured from a 'community

3.2 SITE PROGRAMME

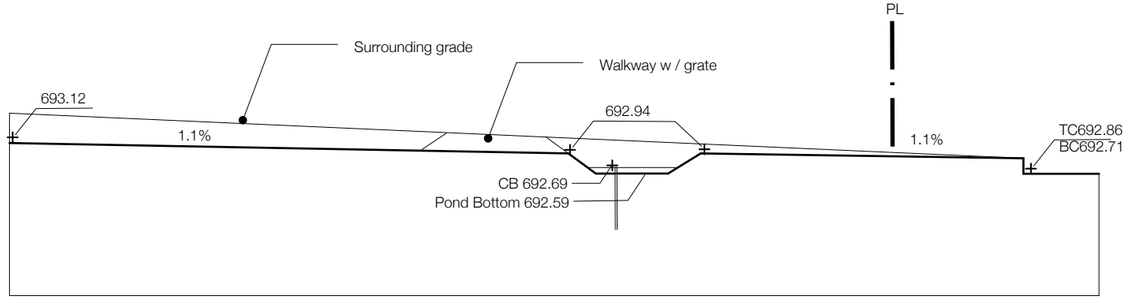
garden' format' with individual raised beds to a single garden area with reduced access paths – to maximize garden area and yield.

- Edible garden is now +/- 260m2 in size. This size is in line with estimates of between180-450m2 for a garden to support the capacity of the restaurant.
- Garden requirements including compost bins and tool storage have now been accommodated.
- Subsurface drip irrigation has been identified as the primary means of irrigating the edible landscape. This system will be connected to a 5000L tank fed by approximately 320m2 of the roof.
- Orchard area has been removed to maximize garden area and yield.
- Minor modification of overlying grid to better align with architectural geometry.

3.3 OVERALL DESIGN

- Minor modification of 'River' pathway
- Increase in size of grass gathering space north of the building to better host activities.
- Reconfiguration of sunken plaza to better align with architectural geometry. Ramp proposed as single point of access, and this ramp is aligned with the site geometry.
- Slight reduction in the numbers of trees and shrubs.
- To ensure that generally the grades in the rain garden area are acceptable.
- To understand where and how the parking lot outlets into the rain garden - if that requires a catch basin, or some type of trench drain

Rain Garden, Portland Convention Centre



Rain Garden Section

Restaurant EdibleGarden

4 Civil Design

4.1 SITE DESCRIPTION

The Site is located in the Summerside district of Edmonton in the north east quadrant of the intersection of 91 Street SW and Savaryn Drive. The Legal lot description is Lot 47, Block 1, Plan 072 9580.

The site is in a newly constructed subdivision and rises slightly from an elevation of 693.25 along the property lines to 693.8 at the north east corner of the site.

A Geotechnical Report was prepared for the site by Shelby Engineering Ltd. This report indicates that the site has a layer of medium plastic clay fill extending to depths ranging from 2.3 to 5.3m below ground level. The clay fill was placed on native glaciolacusterine clay with depths ranging from 4.5 to 7.5 m below ground elevation. Clay till underlies the glaciolacustrine clay to depths ranging from 9.5 to 10.5m below ground level. Bedrock comprised of clay shale underlies the clay till. Groundwater measurements at 23 days after drilling indicate water levels of 2.3 to 8.1m below ground level.

4.2 SITE ACCESS

It is expected that the main, all directional, site access will be off of Savaryn Drive. A right-in right-out access will be required on 91 Street.

The site access/egress and interior vehicle circulation was modeled to ensure access for the City of Edmonton design fire truck. This resulted in recommended changes to the site egress point and modifications to parking lot islands, as well as notifying the City that the island in the street would be in conflict with the front sweep of the design fire truck, effectively cleaning the street signs off the island.

4.3 SITE SERVICING

The site is provide with a 150 mm potable water, 200 mm sanitary and 300 mm storm sewer service from City mains. The existing fire hydrant is within the 45m distance therefore no fire hydrant is required on site.

4.4 SITE GRADING AND STORM WATER MANAGEMENT

The site does not require storm water management, 1:5 year flows are to be directed to the storm sewer service. Flows in excess of the 1:5 year flow are to be directed to the street and will then flow to the storm water pond.

The parking lot has been graded to limit the number of catch basins installed and the runoff from a portion of the parking area will be directed to a rain garden that will be provided on the southern portion of the site.

Runoff from the roof of the building will be captured and used for irrigation purposes further mitigating the effect of increased runoff due to development.

4.5 SITE CONSIDERATIONS

The site development includes a sunken outdoor play space. Drainage from this area is a concern because of the limited depth of the storm sewer connection, however the inclusion of a rain garden to the south provides the ability to safely drain the sunken plaza while mitigating the volume of runoff from the site.

Rain Garden, Mt.Tabor School, Portland

5 Electrical Design Strategies

5.1 GENERAL

The following information is provided as the electrical portion of the Design Development report for the Mosaic Center for Conscious Community and Commerce. The information contained in this report represents the electrical consultant's interpretation of the information provided to date by the client and the architect.

The electrical design will conform to the latest versions of the Canadian Electrical Code, Alberta Building code and any other applicable codes.

Electrical systems and equipment will be designed and specified to be energy conscious, with ease of operation and maintenance, reliable, and flexible, while keeping in mind the possibility for future modifications.

5.2 SITE PROGRAMME

The building is expected to be fed by an exterior utility transformer located on the East side of the building. The electrical distribution will be designed as required by the Canadian Electrical Code and will need to be larger than a traditional building of this size and type due to the PV generation array. There has been no indication that the service is required to be designed for future building additions.

LED pole mounted site lighting will be designed with time clock/ daylight controller to meet minimum light levels; the majority of the site lighting will be accomplished by building mounted lighting. The site lighting will follow IESNA standards for light level as well as maximum and minimum ratios. The Electrical consultant's design will ensure that the light level around the building will be such as not to disturb the adjacent buildings, but provide adequate light to address any visual and safety concerns.

There will be a need for low level lighting to guide future patrons of the restaurant from the parking area to the entry, as well as lighting for the restaurant patio will be required.There will be no car park receptacles within the parking area. A parking stall will be designated for location of a temporary generator.

The building will not be provided with a lightning protection system.

5.3 LIGHTING SYSTEMS (E200)

Open Office: direct/indirect lighting will be provided down egress paths to a 150lux lighting level. Each corridor will have the lighting controlled by line voltage motions sensors. Central low voltage lighting control will not be included in this space. Workstations and separate offices will not be provided with building lighting or switching. Task lighting will be utilized as required in these spaces.

Meeting area: all meeting spaces will be provided with direct/ indirect dimmable lighting fixtures at the center of the table. Dimmable pot lights may also be included around the perimeter of the space for more lighting variety. The power for lighting in these spaces will be controlled by timers.

Restaurant: The kitchen space will be designed to a 500lux lighting level by 600x1200mm recessed LED fixtures. The restaurant area will be looked at with further input from the client during construction documents.

Daycare: The space will be designed with recessed direct LED lighting with a general light level of 300lux. Motion and daylight will be provided through the space but will not have centralized low voltage lighting controls.

Wellness Area: all these space will be designed will appropriate light levels are further discussed with the client and tenants. LED fixtures with individual motion and daylight sensors and dimming will likely continue to be used within these spaces.

Washroom spaces: Washroom areas will be designed at a 200 lux lighting level. Specific fixture type and lighting strategy for this space will be discussed with the client later on in the construction document process.

Exit signage and emergency lighting will be designed to. Emergency lighting will be provided within all corridors serving as an egress path, within congregational spaces such as boardrooms, services spaces including mechanical and IT & Electric rooms and all stair shafts. Emergency lighting will be accomplished with the use of battery pack remote heads.

5.4 POWER DISTRIBUTION (E300)

Utility transformer will likely come from the East side of the site and therefor the electrical room will be located on the main floor close to the incoming service. The service provided to the facility will likely be 1600Amp, 3phase, 208V which will handle all equipment and branch circuit power requirements. 120/208V distribution panels will be located throughout the building as required. Different spaces (Wellness, restaurant...) will be provided with separate panels for possible sub metering. There will not be a UPS system installed as part of the distribution system.

The distribution panel serving the communication room we be separated by a manual transfer switch to allow for the space to be backed up by an emergency generator. The distribution will be designed will an exterior mounted receptacle for a generator to be plugged into, in case of power failure to the building.

All panels and distribution throughout the building will be designed with 20% spare capacity to allow for changes in the future. The entire building's wiring will be placed in EMT conduit and run within ceiling spaces where possible. All wiring will be copper, minimum #12AWG.

The buildings will have electronic monitoring for panels serving different systems and areas in the building. Additional monitoring may be provided by the owner at a later date, but will not be included in the electrical design documents.

5.5 COMMUNICATION SYSTEMS (E300)

Cable tray will be provided throughout the building for all horizontal cabling. Category 6A horizontal cabling will be utilized to meet the high bandwidth requirements of the client and will be provided from the communication racks located in the main floor communication room to each communication jack. Cabling will be run within conduit in all walls and closed ceilings and within a cable tray where possible.

The telephone system will utilize VoIP (Voice over Internet Protocol) technology in addition to power over Ethernet. The phones will be utilized for the public address system. No additional speakers or equipment will be provided for public address. It will be the responsibility of the owner to design provide and install the VOIP phone system with PA capabilities.

There will not be a standalone PA system within this building.

A single communication room located central on the main floor will be used to serve the entire building. Design, specification and layout of the equipment within this space will be provided by the client during the construction document process. The supply and installation of the equipment currently will not be in the electrical contractor's scope.

All cables within the building will be terminated and tested from the jacks to the patch panels located on the racks in the telecommunication room.

5.6 FIRE ALARM SYSTEMS (E400)

An addressable fire alarm system will be provided to meet all relevant codes. There will be smoke detectors within each Mechanical, telecomm & Electric room, at the top of the stair shaft and the elevator shaft. Heat detectors will be provided throughout the facility to meet current code requirements. All initiating signals will be sent to the FACP (Fire Alarm Control Panel) located within the main entrance vestibule.

Sprinkler requirements have not been provided at this stage and will be worked out during the construction document process by the mechanical engineering team. Horn and strobe locations will be determined by ambient noise levels anticipated in the building. The fire alarm will also be tied to the security doors to allow for proper evacuation in the event of a fire.

5.7 CARD ACCESS SYSTEM (E400)

A programmable card access system will be provided to control access into the new building, and likely to separate areas within the building. Exact locations will be identified during the construction document process. The access system will include multi technology card readers and security panel. It is our intent to provide a complete system including conduit wiring and devices with proper instruction by the manufacturer to allow the owner to program, alter, and maintain the system at a later date. The building access system will also be tied to the fire alarm to allow for proper evacuation during an emergency event.

5.8 AUDIO VISUAL (E400)

Conduit will be provided as per the client's requirement for installation of an audio visual system within the meeting rooms at a later date.

Interior view of collision space

6 Mechanical Design Strategies

6.1 MECHANICAL SCOPE DEFINITION

The mechanical systems design for the Mosaic Centre in Edmonton is based upon the following documents:

Alberta Building Code 2006.

National Fire Code 2005.

NFPA 13, Standard for the Installation of Sprinkler Systems, 2013.

The following design conditions are assumed:

1.0% Winter Design Temperature: -36oC

2.5% Summer Design Temperature: 28/18oC (db/wb)

Degree Days below 18oC: 6136.

15 Minute Rainfall: 23 mm.

One Day Rain: 75 mm.

Seismic loading: Za=0, Zv=0, v=0.05; seismic restraints are not needed.

6.2 SITE SERVICES

The building will receive water and sanitary services from the City of Edmonton municipal systems beneath 91st Street SW. A firefighting connection, located within 45 m of the fire hydrant on 91st Street SW will be provided adjacent to the building's firefighting entrance on the north side of the building.

Sanitary Sewer

There will be a 150 mm sanitary connection from the building to the municipal collection system. Sanitary piping will be collected beneath the main floor and directed to the municipal services. Sanitary piping run within the building will be cast iron and copper. Underground sanitary piping will be locally manufactured PVC or ABS.

Storm Sewer

The roof drainage system for the flat roof areas will be collected internally with a small portion to be treated and distributed for irrigation of interior and exterior plantings and possibly to a non-potable water system for use in toilets. A rainwater leader system will collect excess rainwater and transport the water internally to discharge to the site storm water management system.

Domestic Water

Domestic water service to the building will be provided by a 150 mm connection from the municipal main and will serve the building's domestic water and fire suppression systems. Existing municipal fire hydrants are adequate for the sites fire-fighting requirements.

Natural Gas

It is anticipated that a natural gas connection from the utility main will be required for the facilities commercial kitchen and emergency generator.

6.3 HEATING, VENTILATION, AND AIR-CONDITIONING SYSTEMS

Heating, ventilation, and air-conditioning requirements for the facility will be minimized through building geometry and orientation, the use of high performance building envelope design, targeted shading, and a reduction of interior loads. It is also anticipated that a broader envelope for occupant comfort will be tolerated in order to permit more flexibility in the operation of the mechanical systems.

Fresh-Air Ventilation

The ventilation load for the facility will be in the 2,500 lps to 3,000 lps range. Natural ventilation will be permitted when ambient conditions are suitable through the use of manually operable perimeter window and powered louvres or awnings in the upper Lobby area. When natural ventilation is not available, dual-core reversing air-to-air heat exchangers will be provided to extract contaminated air from washrooms, and service area, along with providing general common area exhaust as needed. Tempered supply air from the heat recovery units will be ducted into the occupied spaces as needed to meet the ventilation air quality requirements for each space.

The heat recovery ventilation system will include a heat exchanger by-pass damper that will permit ambient air free cooling of the ventilation air when conditions are suitable. It will also allow for a small amount of manual or automated nighttime purge cycle.

Space Conditioning

Thermal comfort control within the facility will be provided by a Heat-Recovery Variable Refrigerant Flow (VRF-HR) system that uses direct expansion fan coils units distributed throughout the building. Variable Refrigerant Flow (VRF), also referred to as Variable Refrigerant Volume (VRV) is an air-condition system configuration that uses a single refrigerant heat-pump unit serving multiple indoor refrigerant fan coil units. The term variable refrigerant flow refers to the ability of the system to control the volume of refrigerant flowing to the evaporators. This allows the use of a number of evaporators with different capacities and configurations on a single condensing circuit. The arrangement provides individualized comfort control, with an option of allowing simultaneous heating and cooling in different zones. Although this type of system has been widely applied in China, Japan, and Europe, it has only recently been introduced in North America.

VRF systems are essentially an extension of the concept of the well-established ductless split air conditioning systems that operate on the direct expansion (DX) principle. This means that heat is transferred to or from the space directly by circulating refrigerant to fancoils located near or within the conditioned space. Refrigerant flow control is the key to the efficiency and capacity control advantages of VRF systems.

In its simplest form, the ductless split air-conditioning system has a single indoor fan coil evaporator unit connected via refrigeration piping to a condensing unit, normally mounted

outside. The indoor unit draws heat from the space, the refrigerant heat-pump unit rejects that heat to the atmosphere. Multi-split systems are also available that have a single condensing unit that can accommodate a number of indoor fan coil units. Applications for these systems are generally limited to single thermal zone applications. They do not have the ability for individual zone control and usually cycle on and off in response to thermostat control for the entire system.

Variable refrigerant flow systems are similar to the multi-split systems, but the VRF system allows continuous adjustment of the refrigerant flow to each indoor fan coil unit. The control is achieved through the use of a microprocessor controlled pulse modulating valve (PMV) that opens in response to a signal from the thermistor sensors in each fan coil unit. The fan coil units are linked by control wiring to the heat-pump unit which responds to the demand from the fan coil units by varying its compressor speed to match the total cooling and/or heating requirements as determined by the suction gas pressure at the heat pump unit. The compressors are inverter-driven scroll compressors that allow significant capacity control.

VRF systems use refrigerant and oil circuitry with separation tubes and headers to allow branching to each indoor unit. This permits a significant reduction in refrigeration piping over a multi-split system.

Heat recovery variable refrigerant flow systems (VRF-HR) provide the capability to operate a number of fan coils associated with a single heat pump unit simultaneously in heating and/or cooling mode, enabling heat drawn out of one space to be used in another rather than rejected outdoors. The system can then operate in net heating or net cooling mode. Heat recovery systems generally require a third refrigerant pipe to carry hot discharge gas from the compressor to the indoor unit for heating mode operation. Typically, extra heat exchangers in distribution boxes are used to transfer some of the rejected heat from the superheated refrigerant exiting the zone being cooled to the refrigerant that is going to the zone to be heated.

VRF-HR system can have significant efficiency benefits when simultaneous heating and cooling are taking place within a single system, effectively adding the efficiency rating of the portion of the system in heating mode to the efficiency of the system when running in cooling only. For this reason, VRF-HR systems are most beneficial when there is a need for some of the spaces to be cooled while others need to be heated during the same period. This often occurs in the winter in medium-sized to large sized buildings with a substantial core and with significant perimeter exposures.

The main floor lobby will incorporate active slab heating and cooling using a water-to-water heat pump to maintain the slab temperature between 16°C and 28°C depending on the space conditions

Primary Heating and Cooling

Although the heating requirement for the building will be low, there will be a need to augment the heating in the building during the most severe wintertime conditions. It is anticipated that the peak heating load could be in the order of 160kW.

The outdoor units referred to in the discussion of VRF systems can be either air-source or water-source. In our northern environment, air-cooled units are not always effective, and require additional electric heat at lower ambient temperatures in order to provide sufficient heating. Water-source units are often coupled with boilers and fluid coolers for heating and heat rejection. For the Mosaic Centre, the heating and cooling loads are low and are reasonably well balanced. This balance allows for the effective use of ground coupled heat exchange or borehole thermal storage. In heating mode, the heat pumps will operate with a coefficient of performance (COP) greater than 4, allowing for highly efficient use of electricity to heat the building. The peak electrical input required for the heat pumps would be about 30-35 kWs. The peak electrical demand for cooling will also be about 35 kW.

6.4 PLUMBING SYSTEM

Plumbing Distribution System

Each washroom fixture group will be serviced by a 100Ø sanitary sewer line, vent pipe, and domestic water lines with isolation valves and water hammer arrestors.

Plumbing Fixtures

Water closets will be ultra-low flush tank type (ULF) with dual flush action for the Female washrooms. Single flush ULF water closets along with low flush urinals will be used in the Men's. Lavatory will incorporate self-generating, hands free infrared operation of low flow faucets. Showers will use high quality, low-consumption heads.

Hose bib's will be located adjacent to the entrances and as required to facilitate any required plant watering. The water supply for these hose bibs will be from the rainwater storage tank mentioned above in the storm drainage systems. All hose bib's connect to this system will be clearly labelled as "non-potable water".

Domestic Water Heaters

Two hybrid electric/heat pump water domestic water heaters will be used to provide domestic hot water for the washrooms, showers, and other hot water loads. The system will incorporate a temperature responsive domestic hot water recirculation pump to ensure quick access to hot domestic hot water, thereby reducing water consumption and energy loss.

6.5 CONTROL SYSTEM

The majority of the automated interior climate control for the building will be via local zone-based thermostats with integrated occupancy sensors. Centralized equipment, such as heat pumps, pumps, and HRV's are equipped with their own, factory mounted controls and can operate semi-autonomously, only needing a command to run.

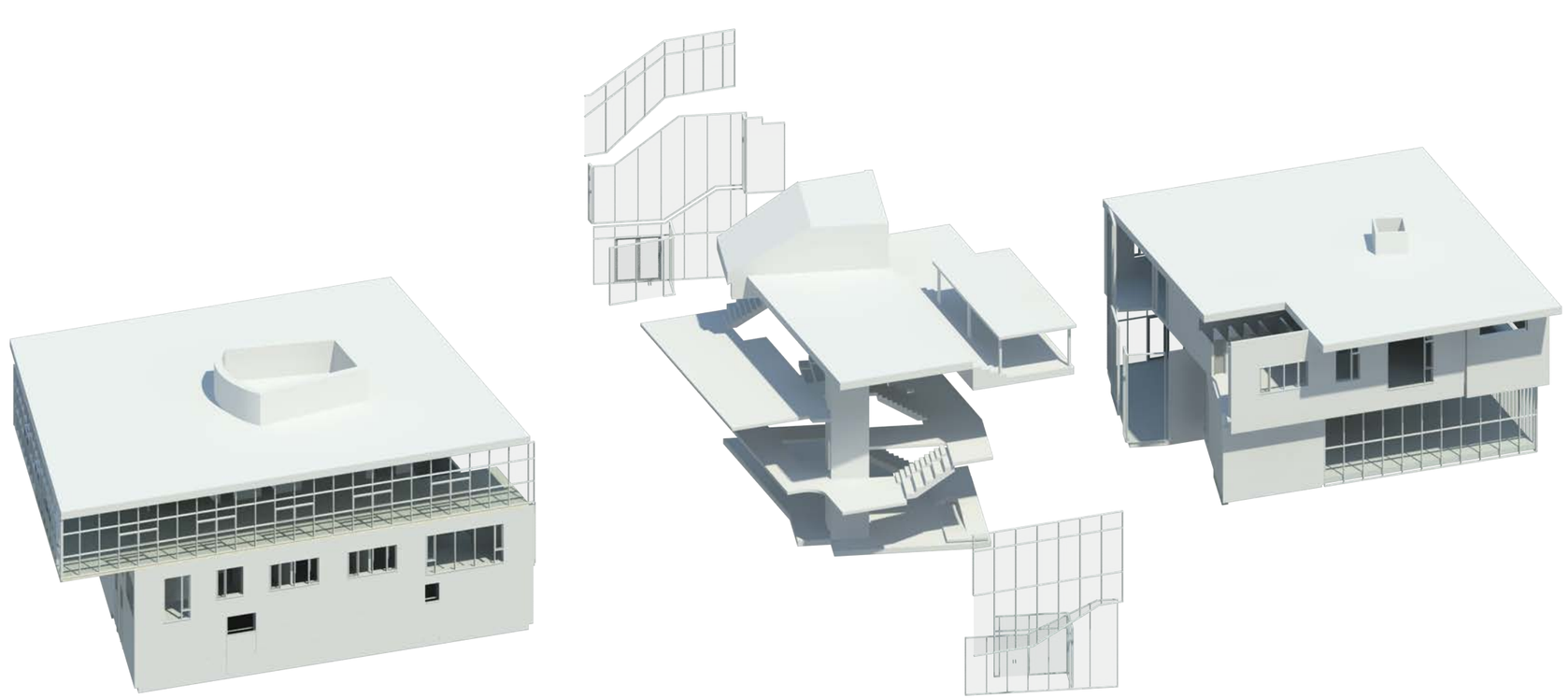
A limited building management control system would be provided using locally supported systems. The system would include a graphical interface that would be accessible via the Internet using a standard web browser. The control system would provide scheduling and for control of any of the common equipment along with monitoring and alarm functions. Pre-cooling and nighttime purge functions could be provided through this Building Management System as either a manual or automated function.

A green-light/red-light system will be incorporated to indicate when it is permissible to use the natural ventilation system via manual operation of the windows. This will be done based on outside air conditions and will be coordinated with the operation of the mechanical louvres in the upper Lobby area.

6.6 FIRE PROTECTION SYSTEM

The building will be fully sprinklered to light hazard occupancy in accordance with NFPA 13. Appropriate zoning will be provided with monitored shut-off valves and valve stations in a location that is readily accessible.

Fire extinguishers will be placed throughout the building.



Axonometric Study of Design

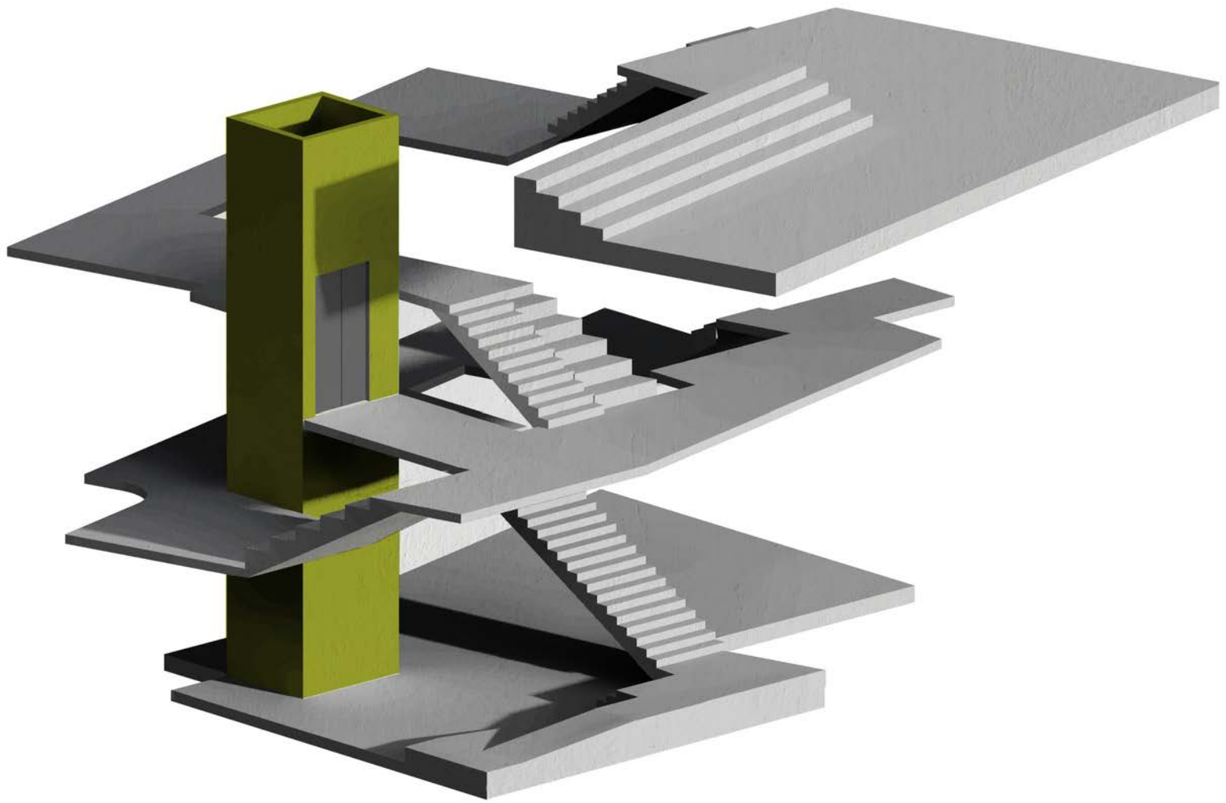
7 Structural Design Strategies

7.1 GENERAL

The proposed new Mosaic Centre for Conscious Community and Commerce in Edmonton will be a 2 and 3-storey heavy timber structure supported on a concrete slab and piles.

7.2 DESIGN UPDATES FROM SCHEMATIC DESIGN

- Glulam floor and roof beam sizes have been refined
- Glulam column sizes have been refined
- Stair locations and major floor and roof openings are being coordinated with architectural
- Steel beam sizes and locations have been indicated at the atrium
- Floor and roof wood panel thickness and profile have generally been confirmed
- Beam cantilever depths have been confirmed
- Concrete topping depth of 50mm confirmed
- Truss member sizes have been refined
- Brace frame locations have generally been confirmed
- Depths of façade backup structural framing have been confirmed
- Beam sizes for PV panel supports confirmed



Axonometric Study of Collision Space

8 Energy Modelling

8.1 GENERAL

Having received the updated Development Permit design from Manasc Isaac, we have investigated the effect semi-transparent façade materials, envelope thermal resistance, natural ventilation, and mechanical system design on overall performance. As well, we have updated the approximate Net Zero Design calculations, and produced a recommended design to move forward with.

8.2 SEMI-TRANSPARENT CURTAIN WALL

To begin, we created a new IES<VE> model of the DP design, with a full room by room breakdown, as shown in Figures 1-4. The semi-transparent façade sections were modeled as glass, with appropriate performance characteristics. To calculate the impact of these semi-transparent systems, another model was generated with all semi-transparent elements replaced with wall, or normal glazing if no window would be left. The geometry with semi-transparent elements removed is shown in Figures 5-8.

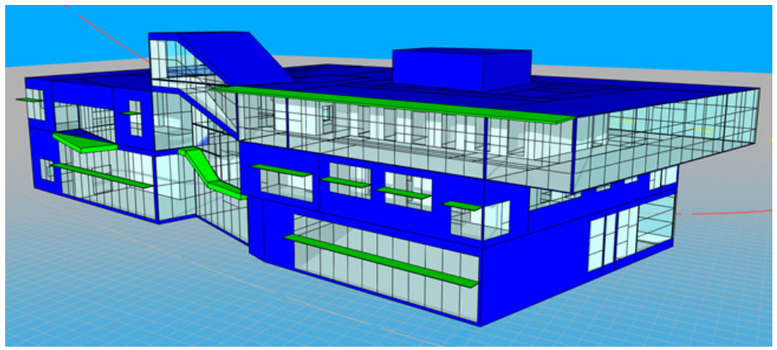


Figure 1: Mosaic Center DP Design, as viewed from the Southeast

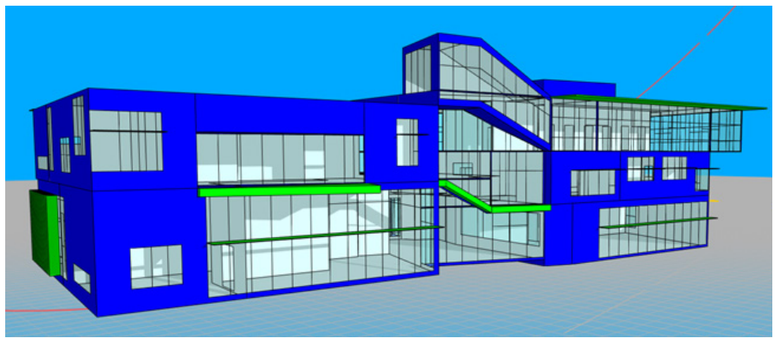


Figure 2: Mosaic Center DP Design, as viewed from the Southwest.

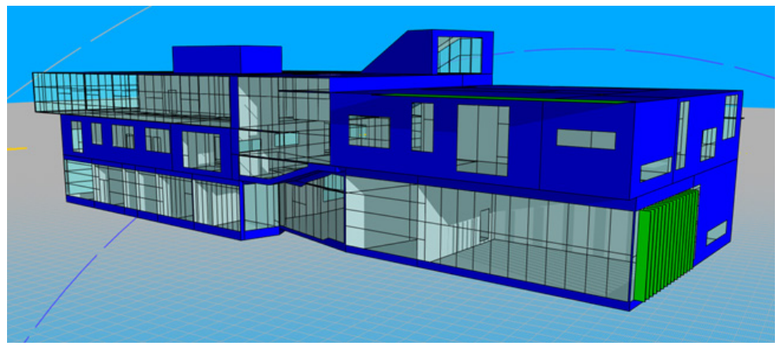


Figure 3: Mosaic Center DP Design, as viewed from the Northwest.

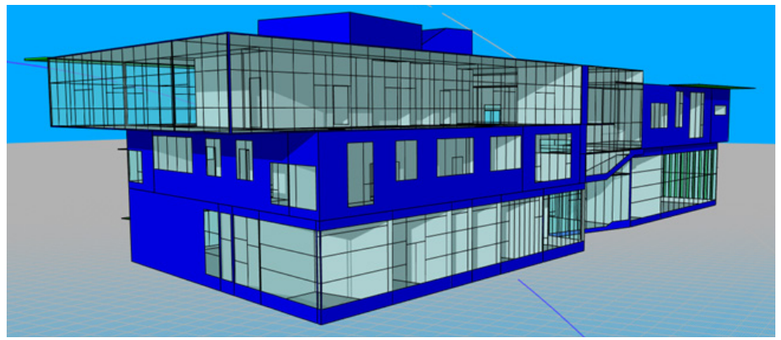


Figure 4: Mosaic Center DP Design, as viewed from the Northeast.

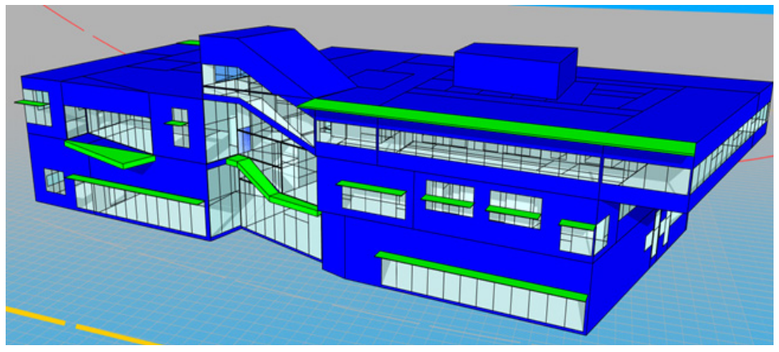


Figure 5: Mosaic Center DP Design, with semi-transparent façade elements removed, as viewed from the Southeast.

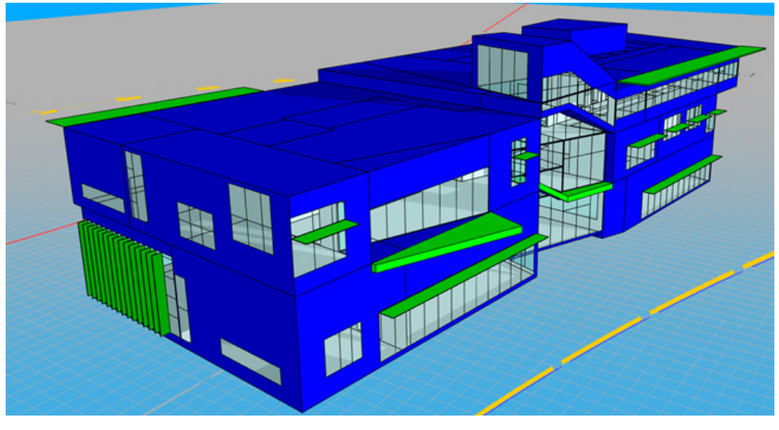


Figure 6: Mosaic Center DP Design, with semi-transparent façade elements removed, as viewed from the Southwest.

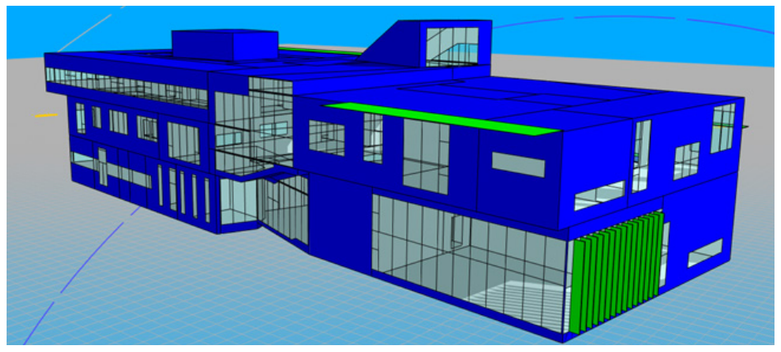


Figure 7: Mosaic Center DP Design, with semi-transparent façade elements removed, as viewed from the Northwest.

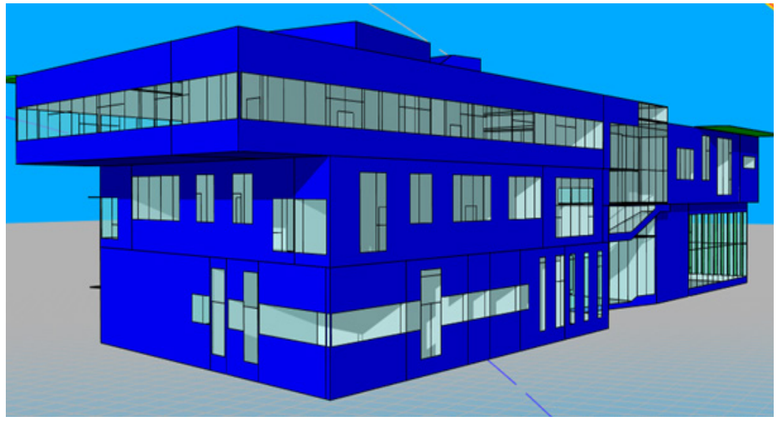


Figure 8: Mosaic Center DP Design, with semi-transparent façade elements removed, as viewed from the Northeast.

After reviewing the available performance in semi-transparent systems, we noted that none were unlikely to improve energy efficiency, as they have low R-value compared to an R30 wall, and their Visual Transmittance seem tied to Solar Heat Gain Coefficient, meaning that these products will increase heating and cooling loads, while reducing lighting demand. With this in mind, we selected the highest performance version, the Solera Aerogel R18 product. The comparative results of using this product or just replacing it with R30 wall are shown in Table 1.

	With Solera	W/O Solera	% Diff
Heating Load [kW]	275 kW	268 kW	-3%
Cooling Load [kW]	120 kW	107 kW	-11%
Heat Demand [kWh/a]	76315 kWh	75637 kWh	-1%
Cool Demand [kWh/a]	21106 kWh	17703 kWh	-16%
Lighting Demand [kWh/a]	27532 kWh	30273 kWh	10%
Equipment Demand [kWh/a]	151340 kWh	151340 kWh	0%
Total Demand [kWh/a]	276293 kWh	274952 kWh	0%
Heat Intensity [kWh/m2a]	27.8 kWh	27.6 kWh	-1%
Cool Intensity [kwh/m2a]	7.7 kWh	6.5 kWh	-16%
Site Intensity [kWh/m2a]	100.7 kWh	100.2 kWh	0%

Table 1: Summary of comparative performance with and without R18 Solera semi-transparent curtain wall product as described above. Constant are R20/R30/R40 slab/wall/roof and R6 glazing.

The calculations show that the highest performance version of the Solera product line provides a slight decrease in energy efficiency, as compared to the design without any semi-transparent elements. From this then, the decision to use this product can be based primarily on aesthetic and cost based motivations. We do not recommend using the lower performance semi-transparent products, as overall energy efficiency will suffer, and we're already having difficulty meeting the Net Zero Energy goal.

8.3 ENVELOPE PERFORMANCE

Next, the impact of investing in higher performance envelope assemblies was calculated, using a number of simulation runs and unit envelope costing data provided by Chandos.

For the purpose of selecting the most cost effective envelope performance level, the comparative amount of PV required to offset each simulation's annual demand was also calculated and priced using a cost of $4/W installed. A summary of this analysis is shown in Table 2 and graphically in Figure 9.

DP - Envelope Op Runs

Glazing	R5.26			R7.72			R16
Design #	1	2	3	4	5	6	7
Envelope Level	R10/R30/R50	R20/R40/R60	R30/R50/R70	R10/R30/R50	R10/R30/R50	R30/R50/R70	R30/R50/R70
Heating Load [kW]	277 kW	274 kW	272 kW	268 kW	268 kW	263 kW	250 kW
Cooling Load [kW]	119 kW	117 kW	116 kW	110 kW	110 kW	108 kW	109 kW
Heat Demand [kWh/a]	84455 kWh	77381 kWh	72345 kWh	77733 kWh	77733 kWh	65620 kWh	48505 kWh
Cool Demand [kWh/a]	20180 kWh	20593 kWh	21060 kWh	18801 kWh	18801 kWh	19670 kWh	22299 kWh
Lighting Demand [kWh/a]	27532 kWh	27532 kWh	27532 kWh	27532 kWh	27532 kWh	27532 kWh	27532 kWh
Equipment Demand [kWh/a]	151340 kWh	151340 kWh	151340 kWh	151340 kWh	151340 kWh	151340 kWh	151340 kWh
Total Demand [kWh/a]	283507 kWh	276846 kWh	272277 kWh	275405 kWh	275405 kWh	264162 kWh	249676 kWh
Heat Intensity [kWh/m2a]	30.8 kWh	28.2 kWh	26.4 kWh	28.3 kWh	28.3 kWh	23.9 kWh	17.7 kWh
Cool Intensity [kwh/m2a]	7.4 kWh	7.5 kWh	7.7 kWh	6.9 kWh	6.9 kWh	7.2 kWh	8.1 kWh
Site Intensity [kWh/m2a]	103.3 kWh	100.9 kWh	99.2 kWh	100.4 kWh	100.4 kWh	96.3 kWh	91.0 kWh
Envelope Cost	$ 1,681,032	$ 1,849,882	$ 2,026,495	$ 2,138,812	$ 2,138,812	$ 2,484,274	$ 2,876,657
PV Size	303 kW	296 kW	291 kW	294 kW	294 kW	282 kW	267 kW
PV Cost	$ 1,210,575	$ 1,182,130	$ 1,162,623	$ 1,175,979	$ 1,175,979	$ 1,127,972	$ 1,066,117
Env + PV Cost	$ 2,891,607	$ 3,032,013	$ 3,189,117	$ 3,314,791	$ 3,314,791	$ 3,612,246	$ 3,942,773

Table 2: Summary of the comparative impact of improving envelope assembly performance on the Mosaic Center designed as per DP drawing. R-values are denoted as slab/wall/roof. Semi-transparent elements were included in the model, using the R18 Solera product.

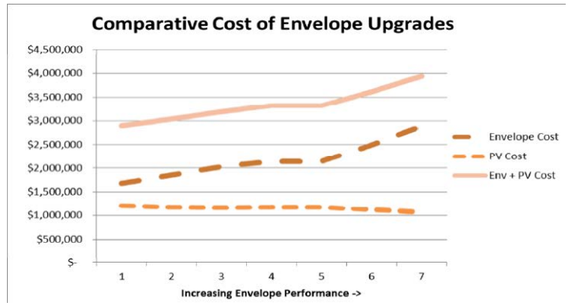


Figure 9: A plot of the comparative cost of envelope improvements and required PV capital cost. Data from Table 2.

8.4 NATURAL VENTILATION

Thirdly, we created a DP design model with the recommended envelope assemblies from the last section, and then added natural ventilation through the available operable windows. The operable window criteria were as follows:

Window will OPEN if: Tindoors > Toutdoors > 14°C

AND

Tindoors > 22°C

This type of control scheme would require automated window operation controlled by building management system. The model spaces were opened as well, so that office doors were generally open, and air could move throughout the connected spaces in the building. The potential for energy savings through natural ventilation is shown in Table 3.

	W/O NV	With NV	% Diff
Heat Demand [kWh/a]	68093 kWh	67829 kWh	0%
Cool Demand [kWh/a]	19782 kWh	11008 kWh	-44%
Lighting Demand [kWh/a]	27532 kWh	27532 kWh	0%
Equipment Demand [kWh/a]	151340 kWh	151340 kWh	0%
Total Demand [kWh/a]	266747 kWh	257709 kWh	-3%
Heat Intensity [kWh/m2a]	24.8 kWh	24.7 kWh	0%
Cool Intensity [kwh/m2a]	7.2 kWh	4.0 kWh	-44%
Site Intensity [kWh/m2a]	97.2 kWh	93.9 kWh	-3%

Table 2: The comparative impact adding operable windows to the Mosaic Center. Envelope levels set at R10/R30/R30/R50/R6 for slab, suspended floor, walls, roof, and glazing. Heating set point dropped to 20°C to allow a larger dead band between natural ventilation and cooling system operation. Air source VRV mechanical system COPs.

The results show that annual cooling demand could be reduced by 44% by making maximum use of natural ventilation. No consideration was given for occupant discomfort due to windy indoor conditions, which may reduce actual natural ventilation time. The cost effectiveness of this strategy could be investigated by including the lifetime operational energy savings, added maintenance costs and capital costs of automated window operation and control. If the operable windows were manual, then the potential savings would lie somewhere between this maximum and an actual decrease in efficiency, depending on how well the windows are operated.

8.5 MECHANICAL SYSTEMS

The final analysis included in this report is a look at the impact of appropriate central plants to provide heating and cooling energy to the Variable Refrigerant Flow fancoils within the building. Four options were investigated, with the results shown in Table 3.

The results show that a natural gas boiler & cooling tower approach would be the lowest cost, if the project wasn't using PV. A close second is an air source heat pump system, in both capital and LCC, followed by geo-exchange. CoGen is not an appropriate technology for this building as the demand profiles do not match the capabilities of typical cogen units.

Note that once the price of PV is included, air source condensers become the lowest cost option, followed by geo-exchange; it is quite expensive to use PV energy to offset natural gas site consumption. Normally then, we would recommend that the air source condenser path be selected. However, since the current design requires more PV collector area than can fit on the building, it's key to note that investing an additional $75 000 (approx.) in the geo-exchange condenser system will result in a 25kW reduction of required PV capacity. This is the lowest cost efficiency upgrade found to date. We thus recommend the use of a geo-exchange tied water source condenser system to supply heating and cooling energy to the Mosaic Center.

	Heating & Cooling Plant Options - Comparative Life Cycle Costing			
	Air Source Condenser Plant	Water Source Condenser Plant + Boiler & Dry Cooling Tower	Water Source Condenser Plant + Geo Field	Water Source Condenser Plant + CoGen + Dry Cooling Tower
Annual Heating Cost	$6,783	$2,056	$4,522	$14,910
Annual Electricity Cost	$18,988	$18,988	$18,768	$0
HC Plant Capital Cost	$116,188	$188,742	$297,456	$342,492
Plant EUL (years)	23	25	30	15
HC Plant Annual Maintenance Cost	$800	$3,210	$800	$12,063
25 yr Op Cost (2% escl)	$825,450	$674,055	$745,978	$477,576
25yr Life Cycle Cost (2%)	$961,638	$943,047	$1,063,434	$1,241,643
25 yr Op Cost (7% escl)	$1,629,985	$1,331,031	$1,473,056	$943,052
25yr Life Cycle Cost (7%)	$1,766,173	$1,600,023	$1,790,512	$1,707,119
Annual Energy Consumption	257709 kWh	332678 kWh	232898 kWh	1035426 kWh
PV Offset Size	275 kW	355 kW	249 kW	n/a
PV Offset Cost	$1,101,420	$1,421,829	$995,379	n/a
Mech + PV - 25yr Life Cycle Cost	$1,237,608	$1,690,821	$1,312,835	n/a
Mech + PV - Capital Cost	$1,217,608	$1,610,571	$1,292,835	n/a

Table 3: Summary of comparative life cycle costing for four different central mechanical plant styles. Assumes present gas price of $4/GJ and $0.10/kWh electricity. Does not include inflation nor financial costs.

8.6 ESTIMATED ENERGY USE BREAKDOWN

If the above design recommendations are followed, then the current estimated energy use breakdown for the Mosaic Center is shown in Table 4 and Figure 10.

We recommend that further detail be put into this breakdown, with the goal of developing the most accurate Net Zero Energy model possible.

MC4 Est. Energy Use Breakdown		
Heating	45395 kWh	18%
Cooling	15825 kWh	6%
Lighting	27532 kWh	11%
Equipment	120766 kWh	49%
Ventilation Aux	30574 kWh	12%
VRV Aux	7489 kWh	3%
Total	247582 kWh	100%

Table 4: Estimated energy use breakdown of current MC4 recommended design. Design to include R10 slab, R30 suspended floor, R30 walls, R50 roof, R6 glazing with fiberglass frames, and geo-exchange tied VRV mechanical system. Natural ventilation benefit not included. Heating set point at 20°C and cooling set point at 25°C.

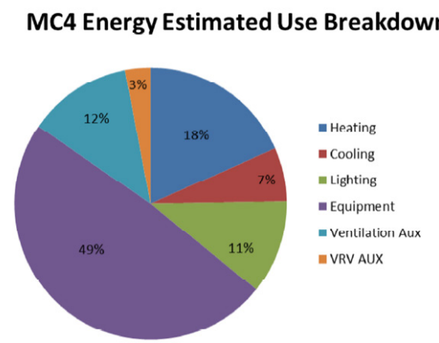


Figure 10: Estimated energy use breakdown of current MC4 recommended design. Design to include R10 slab, R30 suspended floor, R30 walls, R50 roof, R6 glazing with fiberglass frames, and geo-exchange tied VRV mechanical system. Natural ventilation benefit not included. Heating set point at 20°C and cooling set point at 25°C

9 Sustainable Strategies

9.1 Vision

The Founders of the Mosaic Family of Companies are pursuing construction of the “perfect place to work” – The Mosaic Centre for Conscious Community and Commerce. The Mosaic Centre will be a beautiful, environmentally friendly, positive energy environment for building occupants and people of the neighboring business and residential communities to enjoy and recharge in. The owners and project team of the MC4 project believe that net zero energy for larger commercial buildings is possible in Alberta, Canada. This project is to be a catalyst for change and the outcome is not only ‘the best place to work’, but also a blueprint for other owners and project teams to follow.

The Mosaic Centre for Conscious Community and Commerce will be applying for Living Building Challenge Petal Certification (LBC) AND LEED-NC certification. LBC is a newer program and one that no projects have attempted yet in northern Alberta. Part of the reason behind attempting two certifications on this project is to show the similarities and differences between the two programs. Our peers are now comfortable with LEED, this comparison, we hope, will provide lessons learnt showing how LBC can be achieved. The level of LEED certification will be dictated by what will already be implemented for LBC.

LEED Canada-NC 2009 Project Checklist

Mosaic Centre for Conscious Community & Commerce

Yes	?	No			
72	28	8	**Project Totals** (pre-certification estimates)		
			Certified 40-49 points **Silver** 50-59 points **Gold** 60-79 points **Platinum** 80 points and above		
10	14	2	**Sustainable Sites**	**26** Points	
✓			Prereq 1	**Construction Activity Pollution Prevention**	Required
1			Credit 1	**Site Selection**	1
3	2		Credit 2	**Development Density and Community Connectivity**	3, 5
		1	Credit 3	**Brownfield Redevelopment**	1
3	3		Credit 4.1	**Alternative Transportation: Public Transportation Access**	3, 6
1			Credit 4.2	**Alternative Transportation: Bicycle Storage & Changing Rooms**	1
	3		Credit 4.3	**Alternative Transportation: Low-Emitting & Fuel-Efficient Vehic**	3
	2		Credit 4.4	**Alternative Transportation: Parking Capacity**	2
1			Credit 5.1	**Site Development: Protect and Restore habitat**	1
	1		Credit 5.2	**Site Development: Maximize Open Space**	1
	1		Credit 6.1	**Stormwater Design: Quantity Control**	1
		1	Credit 6.2	**Stormwater Design: Quality Control**	1
	1		Credit 7.1	**Heat Island Effect: Non-Roof**	1
	1		Credit 7.2	**Heat Island Effect: Roof**	1
1			Credit 8	**Light Pollution Reduction**	1
3	5	0	**Water Efficiency**	**10** Points	
✓			Prereq 1	**Water Use Reduction**	Required
	2		Credit 1	**Water Efficient Landscaping**	2, 4
	2		Credit 2	**Innovative Wastewater Technologies**	2
3	1		Credit 3	**Water Use Reduction**	2 - 4
33	2	0	**Energy & Atmosphere**	**35** Points	
✓			Prereq 1	**Fundamental Commissioning of Building Energy Systems**	Required
✓			Prereq 2	**Minimum Energy Performance**	Required
✓			Prereq 3	**Fundamental Refrigerant Management**	Required
19			Credit 1	**Optimize Energy Performance**	1 - 19
7			Credit 2	**On-Site Renewable Energy**	1 - 7
2			Credit 3	**Enhanced Commissioning**	2
2			Credit 4	**Enhanced Refrigerant Management**	2
3			Credit 5	**Measurement and Verification**	3
	2		Credit 6	**Green Power**	2
5	3	6	**Materials & Resources**	**14** Points	
✓			Prereq 1	**Storage and Collection of Recyclables**	Required
		3	Credit 1.1	**Building Reuse: Maintain Existing Walls, Floors, and Roof**	1 - 3
		1	Credit 1.2	**Building Reuse: Maintain Interior Non-Structural Elements**	1
2			Credit 2	**Construction Waste Management**	1 - 2
	1	1	Credit 3	**Materials Reuse**	1 - 2
1	1		Credit 4	**Recycled Content**	1 - 2
2			Credit 5	**Regional Materials**	1 - 2
	1		Credit 6	**Rapidly Renewable Materials**	1
		1	Credit 7	**Certified Wood**	1
14	1	0	**Indoor Environmental Quality**	**15** Points	
✓			Prereq 1	**Minimum Indoor Air Quality Performance**	Required
✓			Prereq 2	**Environmental Tobacco Smoke (ETS) Control**	Required
1			Credit 1	**Outdoor Air Delivery Monitoring**	1
1			Credit 2	**Increased Ventilation**	1
1			Credit 3.1	**Construction IAQ Management Plan: During Construction**	1
1			Credit 3.2	**Construction IAQ Management Plan: Before Occupancy**	1
1			Credit 4.1	**Low-Emitting Materials: Adhesives and Sealants**	1
1			Credit 4.2	**Low-Emitting Materials: Paints and Coatings**	1
1			Credit 4.3	**Low-Emitting Materials: Flooring Systems**	1
1			Credit 4.4	**Low-Emitting Materials: Composite Wood and Agrifibre Produc**	1
1			Credit 5	**Indoor Chemical and Pollutant Source Control**	1
1			Credit 6.1	**Controllability of System: Lighting**	1
1			Credit 6.2	**Controllability of System: Thermal Comfort**	1
1			Credit 7.1	**Thermal Comfort: Design**	1
1			Credit 7.2	**Thermal Comfort: Verification**	1
1			Credit 8.1	**Daylight and Views: Daylight**	1
	1		Credit 8.2	**Daylight and Views: Views**	1
6	0	0	**Innovation in Design**	**6** Points	
1			Credit 1.1	**Innovation in Design**	1
1			Credit 1.2	**Innovation in Design**	1
1			Credit 1.3	**Innovation in Design**	1
1			Credit 1.4	**Innovation in Design**	1
1			Credit 1.5	**Innovation in Design**	1
1			Credit 2	**LEED® Accredited Professional**	1
1	3	0	**Regional Priority**	**4** Points	
1			Credit 1	**Durable Building**	1
	1		Credit 2.1	**Regional Priority Credit**	1
	1		Credit 2.2	**Regional Priority Credit**	1
	1		Credit 2.3	**Regional Priority Credit**	1

Living Building Challenge - Quick Look

Updated: September 17, 2013

** = optional additional documentation if required.*

Category		Description	LEED Comparison	Probability of Achievement	Project Comments	Responsibility	Disciplines Involved	Documentation	
Site				*Attempting*					
	1 Limits to Growth	previously dev, greyfields/brownfields. Or not: farmland,near floodplain, near wetlands, old growth forest, native prairie (& 30meters separation from)	similar to LEED NC (SSc1)	High - Med *(Required)*	MC4 is on a previously dev site- however we must confirm that it has been developed since Dec 31, 2007. AND that the development was extensive to the land, since there were no previous buildings on the land. *Developer has confirmed work started prior to Dec 2007.* ***EA*** *to confirm if site work shown on environmental report meets requirements of program.*	Owner (site selection)	Architect needs to be aware of requirements and locate building on site not near any issue areas.	Owner (or consultant) - historic site image (2007dec), flood map. Landscape - landscape plan.	*
	2 Urban Agriculture	Floor Area Ratio calculation - see chart	not in LEED NC	Med	calculate - but can do. Since FAR = 0.39, 30% of project site area needs to be agriculture. Can be vertical. Can partner with near by solutions - Scale Jumping. ***EA*** *confirming with LBC what % we must meet (25% or 30%).* ***Peter*** *confirming calculation of what % is feasible as project design stands now.* ***Matt*** *and DIRTT need to connect to confirm energy requirements for vertical garden.*	Landscape	Landscape	Landscape - one page narrative + photographs throughout the year.	
	3 Habitat Exchange	For each hectare of development, an equal amount of land away from the project site must be set aside in perpetuity as part of a habitat exchange	similar to LEED NC (SSc5.1)	Med-Low	possible to work with Edmonton Land Trust. We need to provide receipt letter. Hectars = 0.74919453 (Acres = 1.8513) Pamela Wight 780-483-7578 $3,000 to $3,500 per acre .So for this natural area, 1.86 acres would cost between $5,580 to $6,510 for the land itself, outside their acquisition costs. ***EA*** *to obtain second price from Ducks Unlimited or other equivalent land trust.*	Owner	Owner	Owner (or consultant) - donation reciept and offical letter outlining offset.	
	4 Car Free Living	Calculate density and services in the surrounding area, this imperative does not require getting rid of cars.	similar to LEED NC (SSc2)	Med	**IT'S Possible!** And calculations have been completed and uploaded to basecamp. No occupancy type is higher than 60% - see calculations. And we can confirm we increased the FAR from 0 to 0.39. **EA completed documentation.**	Owner	Owner, architect, civil	Owner (or consultant) - site density before & After project, LBC questionnaire.	
Water				*Not Attempting*		Responsibility	Disciplines	Documentation	
	5 Net Zero Water	One hundred percent of the project's water needs29 must be supplied by captured precipitation or other natural closed loop water systems30 that account for downstream ecosystem impacts, or by re-cycling used project water. Water must be appropriately purified without the use of chemicals.	Beyond LEED NC (WEc2)	Low - No	not attempting - due to cost and our climate. *However, some rainwater capture may be installed for urban agricultural use.* ***Russ + Peter*** *to confirm. EA + MIA confirmed in meeting that there are no official regulations by provincial or federal governments to treat rainwater used for irrigation. However, the province advises that it is a good idea.*	Mechanical	Mechanical, Owner	Mechanical - two page narrative describing systems. Owner - photographs of the systems, water bills for 1 year, meter readings for 1 year.	
	6 Ecological Water Flow	One hundred percent of storm water and used, project water discharge must be managed onsite to feed the project's internal water demands or released onto adjacent sites for management through acceptable natural time-scale surface flow, groundwater recharge, agricultural use or adjacent property needs.	Beyond LEED NC (SSp1)	Low - No	not attempting - due to cost and climate.	Civil & or Mechanical	Civil, Mechanical, Owner	Civil and or Mechanical - two page narrative describing systems and locations on site. Water balance calculations. LBC Questionnaire. Owner - photographs of the systems.	
Energy				*Attempting*		Responsibility	Disciplines	Documentation	
	7 Net Zero Energy	One hundred percent of the project's energy needs33 must be supplied by on-site renewable energy34 on a net annual basis.	Beyond LEED NC (EAc1)	High - Yes	yes - major goal of this project. Will need to submit an explanation narative re: commercial kitchen natural gas hook up.	Energy Modeler	Energy Modeler, Arch, Mech, Elec, Structural etc.	Energy Modeler - Two page narrative describing systems, function and locations on site. LBC questionnaire. Owner - photographs of systems, Energy bills for 1 year. Monthly meter readings for 1 year.	*
Health				*TBC*		Responsibility	Disciplines	Documentation	
	8 Civilized Environment	Every occupiable interior space of the project must have operable windows that provide access to fresh air and daylight	Beyond LEED NC (IEQc6.2)	Yes	Unsure if project will persue this Imperative, as it has an effect on the Energy Petal. ***EA*** *to obtain official relaxation on number of operable windows if we are supplying more fresh air via HVAC.* ***EA*** *confirming definition of 'occupiable space'.*	Architect	Architect, Energy Modeler, Owner	No documentation requirements	
	9 Healthy Air	Entryway mats, no smoking, copy rooms & janitorial room ducting, ASHRAE 62 ventilation rates, CO2 monitoring, and IAQ testing pre-occupancy.	Combined LEED NC credits & prerequisites (IEQp2,IEQc2, IEQc5, IEQ3.2) and went Beyond.	Med - Low	All items look possible, only one possible issue is CO2 monitoring (cost wise). Must also test air at 9 months after occupancy. ***EA*** *to confirm if CO2 requires only monitoring or monitoring and controlling?* ***Russ*** *to provide guesstimate of how many sensors and provide to* ***Chandos*** *to complete a cost estimate.*	Mechanical	Mechanical, Architect, Owner, Commissioner (or other).	Mechanical - one page narrative describing ventilation approaches. Owner - Results from air testing (pre & post occupancy). Commissioner - performance verification of monitoring equipment for CO2, temperature and humidity.	*

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Category	Description	LEED Comparison	Probability of Achievement	Project Comments	Responsibility	Disciplines	Documentation
							** = optional additional documentation if required.*
10 Biophilia	2,000 m2 of the project there must be: Environmental features Natural shapes and forms Natural patterns and processes Light and space Place-based relationships Evolved human-nature relationships	Not in LEED NC	High	Yes, this can be accomplished with design. ***EA*** *confirming is 2000m2 is fixed or a % of building.* ***MIA*** *to confirm design includes items listed.*	Architect	Architect, Owner, Landscape	Architect - two page illustrative narrative describing biophilia elements of design. LBC Questionnaire. *
Materials		*Not Attempting*			Responsibility	Disciplines	Documentation
11 Red List	The project cannot contain any of the following Red List materials or chemicals42. Asbestos Cadmium Chlorinated Polyethylene and Chlorosulfonated Polyethlene43 Chlorofluorocarbons (CFCs) Chloroprene (Neoprene) Formaldehyde (added) Halogenated Flame Retardants44 Hydrochlorofluorocarbons (HCFCs) Lead (added) Mercury Petrochemical Fertilizers and Pesticides45 Phthalates Polyvinyl Chloride (PVC) Wood treatments containing Creosote, Arsenic or Pentachlorophenol	Beyond LEED NC (IEQc4)	Low - No	It is the wishes of the owners to attempt to meet this red list as much as possible, without compromising local products available and costs. Probability of achievement is low. ***EA*** *contacting Canadian projects to attempt to obtain additional red list material data.* ***EA*** *to create material decision matrix.* ***ALL TEAM MEMBERS*** *to review red list material lists on basecamp. If the product you need is not on the list research it. If you can not find what you need, you may ask EcoAmmo for assistance. If EA can not find a solution, then use the material decision matrix spreadsheet to obtain information from a few options and provide data with suggested choice to EA + Owner. The selection of materials is a part of the story the Owner would like to share, so please record your process and findings in a way you have already agreed to share (ie: blogging, tweeting, emails etc.).*	Contractor / second = Architect	Architect, Contractor, Mech, Elec, Structural, etc. ALL TEAM MEMBERS	Architect (or in our case Owner's consultant) - copy of back up data to prove material compliance. Copy of letters written to manufacturers that contain RED list items. *
12 Embodied Carbon Footprint	The project must account for the total footprint of embodied carbon (tCO2e) from its construction through a one-time carbon offset tied to the project boundary.	Not in LEED NC / Beyond LEED NC (EAc6)	Med - Low	Looks possible to achieve - must confirm offsetting options and costs. *Certified Emission Reduction (CER) and Verified Emission Reduction (VER) carbon credits are suitable for purchase; Renewable Energy Certificates (REC) are not acceptable. The purchase of carbon offsets must directly support a new Renewable Energy project, and the selling agency must be able to demonstrate that it conforms to the minimum performance criteria listed in the Dialogue. The amount of carbon offsets required may be reduced by fifty percent for renovations of existing buildings.* ***EA*** *to speak with Owner regarding options for compliance.*	Owner or Architect	ALL TEAM MEMBERS	Owner or Architect (or in our case Owner's consultant) - Carbon calculator input and output data. Receipt from carbon offset as proof-of-purchase.
13 Responsible Industry	All wood must be certified to Forest Stewardship Council (FSC)	Beyond LEED NC (MRc7)	Low - No	No, as we can not purchase locally grown FSC wood, the project team would prefer to support the local economy than sustainably managed forrests. *May 25 - EA Confirmed, washington is within the zone limit and therefore it comes back to cost. the distance excemption is not an option.* ***Chandos*** *to obtain updated FSC data and pricing and record information to tell the story of why the project is not attempting this initative.*	Contractor (to tell the story of why not chosen)	Architect, structural, constractor	Architect or Contractor - FSC Chain of custody numbers and receipts of all wood on project. Copy of letters written to the national trade associations and ASTM requesting third-party standards for metal, stone and rock industries. *
14 Appropriate Sourcing	Source locations for materials and services must adhere to the restrictions listed in the LBC handbook. Including: ideas, renewable technologies, assemblies, consultant travel, light, medium and heavy density materials.	Beyond LEED NC (MRc5)	Med	Yes, supporting the local economy and reducing GHG emissions is a main goal of this project and it's team. ***ALL TEAM MEMBERS*** *- to complete material decision matrix when selecting materials.*	Architect or Contractor	ALL TEAM MEMBERS	Architect or Contractor - copy of back up data to prove material compliance. Owner consultant - team list with locations and proximity to project site. Km's traveled. *
15 Conservation + Reuse	The project team must strive to reduce or eliminate the production of waste during design, construction,operation, and end of life in order to conserve natural resources. The project team must create a Material Conservation Management Plan. Project must also meet specified % waste diversion for specific materials as outlined in the handbook.	Beyond LEED NC (MRc2)	High	yes, this requires diligence and documentation but there is no red flag that would suggest this imperative can not be achieved.	Contractor	Contractor, ALL TEAM MEMBERS	Contractor - completed conservation management plan, copy of receipts, recycling %, recyclers, tipping fees, waste haulers, diversion site addresses, and salvage services. Calculation of waste diversion (by weight) in each category. Calculation must correlate to receipts provided. photographs. LBC questionnaire.
Equity		*Not Attempting*			Responsibility	Disciplines	Documentation
16 Human Scale	The project must be designed to create human-scaled rather than automobile-scaled places. See chart in Handbook for specific requirements for Surface Cover (parking lots), Streets & Intersections, Signage, and Proportion.	Not in LEED NC	NO	yes, with investigation of surface parking requirements. Achievement possible. After investigation - we are not attempting this as we have too much surface parking.	Architect	Architect, Owner, Civil, Landscape	Architect (or in our case owner's consultant) - one page illustrative narrative describing human scale and culture of community.

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Category		Description	LEED Comparison	Probability of Achievement	Project Comments	Responsibility	Disciplines	Documentation
								** = optional additional documentation if required.*
17	Democracy + Social Justice	Access for those with physical disabilities must be safeguarded through designs meeting the Americans with Disabilities Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines.	Not in LEED NC	High - Yes	yes, this can be achieved with design. ***MIA*** *to confirm there are no major discrepencies between Canadian and US ABA standards.*	Architect	Architect, Owner	Architect or Owner - one page narrative describing accessibility of project.
18	Rights to Nature	The project may not block access to, nor diminish the quality of, fresh air, sunlight and natural waterways for any member of society or adjacent developments.	Not in LEED NC	Med - Low	Calculations for neighbouring sites and buildings to be completed, and most restrictive is the requirement that all building operations follow the RED List. ***EA*** *to determine which disciplines are responsible for which portions of this initiative.*	Architect	Architect, Owner	Architect - calculations or 3D diagrams demonstrating compliance. LBC questionnaire. *
Beauty				*Attempting*		Responsibility	Disciplines	Documentation
19	Beauty + Spirit	The project must contain design features intended solely for human delight and the celebration of culture, spirit and place appropriate to its function.	Not in LEED NC	High	yes, can be achieved with design	Architect	Architect, Owner,	Architect - four page essay describing imperative compliance with photos, diagrams and dwgs to help illustrate concept. Owner - two page essay describing imperative compliance in their own eyes. Informal survey results from occupants on their opinion.
20	Inspiration + Education	Educational materials about the operation and performance of the project must be provided to the public84 to share successful solutions and to motivate others to make change. Non-sensitive areas of the project must be open to the public at least one day per year to facilitate direct contact with the Living Building Challenge.	Not in LEED NC	High *(Required)*	yes, this is a goal of the owner group already.	Owner	Owner, Contractor	Owner - record of 'open day', website link, brochure copy, copy of signage, ILBI case study, optional video. LBC questionnaire. Contractor - copy of O&M manual.

10 Specifications

Division 01 - General Requirements

01 11 00 Summary of Work

01 11 16 Work By Others

01 14 00 Work Restrictions

01 29 76 Progress Payment Procedures

01 31 19 Project Meetings

01 32 16 Construction Schedule

01 33 00 Submittal Procedures

01 35 00 Delegated Design

01 35 29 Health and Safety Requirements

01 35 43 Environmental Procedures

01 41 00 Regulatory Requirements

01 45 00 Quality Control

01 47 18 Indoor Air Quality, Construction

01 51 00 Temporary Utilities

01 52 00 Construction Facilities

01 56 00 Temporary Barriers and Enclosures

01 61 00 Common Product Requirements

01 71 00 Examination and Preparation

01 73 00 Execution

01 74 11 Cleaning

01 74 21 Construction Waste Management and Disposal

01 77 00 Closeout Procedures

01 78 00 Closeout Submittals

01 79 00 Demonstration and Training

01 81 13 Sustainable Design Requirements

-LBC Requirements

-LEED Requirements

-Red List Materials

01 91 13 General Commissioning

01 91 51 Building Management Manual

Division 03 - Concrete

03 05 05 Testing of Concrete and Reinforcement

03 10 00 Concrete Forming and Accessories

03 20 00 Concrete Reinforcement

03 30 00 Cast-In-Place Concrete

03 35 00 Concrete Finishing

03 40 00 Precast Concrete

-Precast Splashpads

Division 04 – Masonry

04 21 13 Brick Masonry

-Reclaimed BRick Masonry

Division 05 - Metals

05 05 05 Testing of Structural Steel and Steel Deck

05 10 00 Structural Steel

05 31 00 Steel Deck

05 41 00 Wind Bearing Steel Stud Systems

05 50 00 Metal Fabrications

05 51 00 Metal Stairs

Division 06 - Wood, Plastics and Composites

06 10 00 Rough Carpentry

06 15 00 Wood Decking

-WestDeck (Glued-Laminated Timber)

06 18 10 Glued-Laminated Structural Units

-Western ArchRib

06 20 00 Finish Carpentry

06 40 00 Architectural Woodwork

06 60 00 Plastic Fabrications

06 74 13 Fibreglass Reinforced Gratings

Division 07 - Thermal and Moisture Protection

07 21 13 Board Insulation

07 21 19 Foamed-in-Place Insulation

07 21 29 Sprayed Insulation

07 26 00 Vapour and Air Retarders

07 42 33 Polycarbonate Wall Panels

07 42 43 Photovoltaic Collector Panels

07 44 53 Glass-Fiber-Reinforced Cementitious Panels

-HardiPanels

07 46 23 Wood Siding

-Cedar Siding

-Charred Wood

-Carbonized Wood

07 52 00 Modified Bituminous Membrane Roofing

07 62 00 Sheet Metal Flashing and Trim

07 84 00 Firestopping and Smokeseals

07 92 00 Sealants

Division 08 - Openings

08 06 10 Door Schedule

08 06 70 Hardware Schedule

08 11 13 Metal Doors and Frames

08 11 16 Aluminum Doors and Frames

08 14 00 Wood Doors

08 43 13 Aluminum-Framed Storefronts

08 44 12 Composite Curtain Wall & Assemblies

-GlasCurtain/Ferguson

-integral sunshades?

08 54 00 Composite Windows

-Cascadia/Duxton?

08 71 00 Door Hardware

08 71 13 Automatic Door Operator

-Low energy operator

08 80 50 Glazing

-smoke baffles

-glass balustrade and handrail

Division 09 - Finishes

09 06 00 Schedule for Finishes

09 06 00.13 Room Finish Schedule

09 21 16 Gypsum Board Assemblies

09 22 00 Non-Structural Metal Framing

09 30 13 Tiling

-Washrooms and Showers

09 51 13 Acoustic Ceiling Systems

-Armstrong SoundScape Clouds

09 54 13 Open Metal Mesh Ceilings

-PINTA ULTRA

09 77 53 Living Wall

09 91 00 Painting

09 96 25 Seamless Epoxy Flooring

Division 10 - Specialties

10 14 03 Interior Signage

10 17 16 Telephone Enclosures

10 21 13 Toilet Compartments

10 26 00 Wall Protection

-Sanitary wall protections: Janitorial rooms

-Corner guards: Service and utility areas

10 28 13 Toilet and Bath Accessories

10 51 13 Lockers

Division 11 - Equipment

11 26 00 Unit Kitchens

-IKEA/prefab kitchens and units

Division 12 - Furnishings

12 24 00 Window Shading

12 48 13.13 Entrance Mats

13 34 13.13 Greenhouses

Division 14 - Conveying Equipment

14 20 00 Elevators

- LULA Elevator

Division 20 - General Mechanical

20 00 13 General Mechanical Provisions

20 00 23 Mechanical Spare Parts & Maintenance Materials

20 01 06 Documentation

20 02 10 Motors

20 03 10 Testing

20 03 20 Mechanical Systems Balancing

20 04 10 Chemical Treatment Equipment & Procedures

20 05 19 Volume/Flow Meters

20 05 23 Valves

20 05 25 Pressure Gauges and Thermometers

20 05 29 Pipe and Equipment Supports

20 05 30 Pipe and Duct Penetrations and Fire Stops

20 05 31 Access Doors in Walls/Ceilings

20 05 43 Mechanical Identification

20 05 48 Mechanical Vibration Control

20 15 00 Tanks

20 20 10 Pipe and Pipe Fittings

20 20 30 Piping and Equipment Insulation

20 20 40 Expansion Compensation

20 20 60 Pumps

20 30 10 Variable Speed Drive Systems

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21 13 13 Wet Pipe Fire Suppression Sprinkler Systems

21 21 16 Hand Held Fire Extinguishers

Division 22 - Plumbing

22 05 10 Plumbing Systems and Specialties

22 15 10 Lab Air Compressors & Accessories

22 34 10 Domestic Water Heaters

22 42 10 Plumbing Fixtures and Trim

22 63 10 Laboratory Gas Systems

22 67 10 Laboratory Vacuum System

Division 23 - Heating, Ventilating and Air Conditioning (HVAC)

23 07 13 Ductwork and Breeching Insulation

23 09 00 BMCS General Requirements

23 21 10 Hydronic Systems Specialties

23 21 11 Glycol System

23 22 10 Steam Specialties

23 31 13 Ductwork

23 31 20 Ductwork Cleaning

23 33 10 Duct Accessories

23 33 19 Silencers

23 36 11 Electronic Single Duct Air Terminal Units

23 36 12 Laboratory Air Terminal Units

23 37 10 Air Outlets and Inlets

23 41 10 Air Filters

23 51 10 Breeching and Chimneys

23 52 33 Copper Water Tube Boilers (88% Eff.)

23 52 34 Low Pressure Steam Packaged Water Tube Boiler

23 57 12 Plate Heat Exchangers

23 64 17 Air Cooled Packaged Chillers

23 65 10 Condensers and Dry Coolers

23 73 10 Custom Fabricated Indoor Air Handling Unit

23 73 11 Custom Fabricated Exhaust Units

23 82 10 Hydronic Terminal Heat Transfer Units

23 82 16 Coils

23 82 32 Packaged Heat Recovery Systems

23 84 11 Steam Grid Humidifiers

Division 25 - Integrated Automation

25 10 00 BAS Control Integration

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26 05 00 Electrical General

26 05 05 Electrical Materials and Methods

26 05 32 Outlet Boxes

26 05 73 Coordination Study

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26 27 26 Wiring Devices

26 28 23 Disconnect Switches

26 29 01 Contactors

26 29 10 Motor Starters

26 32 14 Diesel Electric Generating Unit

26 33 16 Battery Racks

26 33 43 Battery Chargers

26 33 53 UPS Static

26 36 23 Automatic Load Transfer Equipment

26 41 13 Lightning Protection Equipment

26 50 00 General Lighting

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27 11 19 Communication Cabling

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28 31 00 Fire Detection and Alarm

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32 01 00 Operation and Maintenance of Exterior Improvements

32 01 91 Protection of Existing Trees

32 13 13 Concrete Paving, Sidewalks, Curbs, and Gutters

32 13 16 Site Concrete Finishes

32 14 00 Unit Paving

32 17 13 Rubber Parking Bumpers

32 17 23 Painted Pavement Markings

32 30 00 Fences and Gates

32 91 13.16 Mulching

32 91 19.13 Topsoil and Finish Grading

32 92 23 Sodding

32 93 00 Plant Material

32 94 13 Landscape Edging

Division 33 - Utilities

33 36 17 Subgrade Drainage Network

Available Information

Geotechnical Report

END OF SECTION

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