mini metropolis

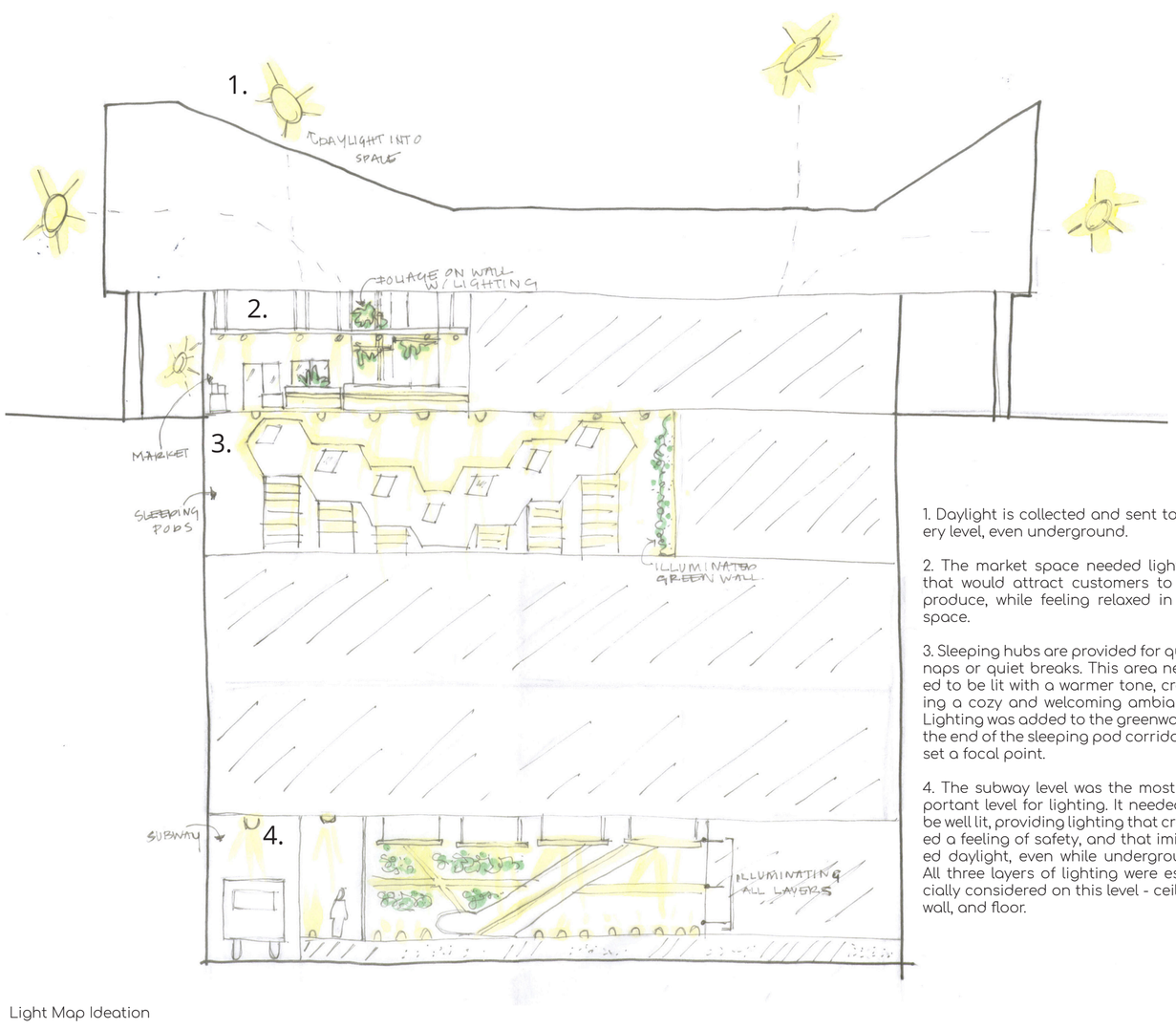
Mini Metropolis is a transportation hub that provides visitors with a comfortable experience while traveling. With access to the monorail, buses, cars, and the subway, this transportation hub is designed to be simply "put in the ground" and located anywhere in the world. Utilizing reusable water, daylight harvesting, and geothermal energy creates a structure that uses natural resources, giving people a sustainable space to travel through.

In addition to transportation access, Mini Metropolis offers visitors a market where they can shop in person, or order their groceries on the Market Kiosks, and pick them up, avoiding the hassle of grocery shopping. On two levels there are sleeping pods where travelers and commuters can relax from their trip. User-friendly ticketing stations and a simplified subway design help to make traveling easier.

The design of the hub seeks to give any visitor a stress-free, safe, traveling experience. This is accomplished through lighting design which utilizes daylight harvesting to develop biophilic design, as well to create an overall feeling of safety for travelers. When daylight harvesting is not being used, CRI values of artificial lighting will imitate daylight to increase the feeling of safety and to connect people to nature once again. Through lighting, the concept of Mini Metropolis is enhanced and gives travelers, commuters, and visitors a unique traveling experience.

main concepts

1. Daylight harvesting in collaboration with artificial lighting.
2. Lighting to create a feeling of safety.
3. Using circadian stimulation values to imitate daylight.
4. Layering light.
5. Light to eliminate the feeling of being underground.



Light Map Ideation

1. Daylight is collected and sent to every level, even underground.

2. The market space needed lighting that would attract customers to the produce, while feeling relaxed in the space.

3. Sleeping hubs are provided for quick naps or quiet breaks. This area needed to be lit with a warmer tone, creating a cozy and welcoming ambiance. Lighting was added to the greenwall at the end of the sleeping pod corridor to set a focal point.

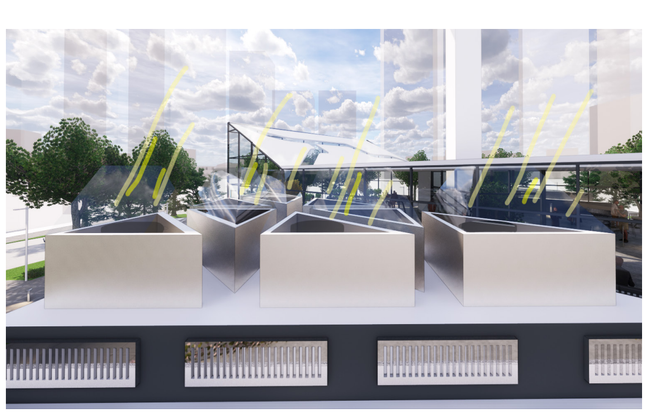
4. The subway level was the most important level for lighting. It needed to be well lit, providing lighting that created a feeling of safety, and that imitated daylight, even while underground. All three layers of lighting were especially considered on this level - ceiling, wall, and floor.

Plant Structure Detail

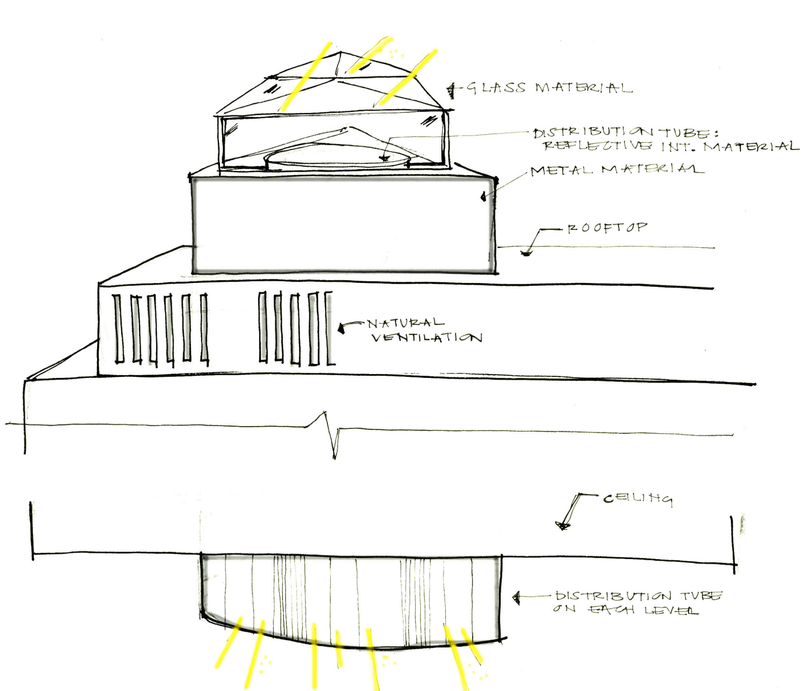
A main feature of the design of Mini Metropolis is the centralized plant structure. This structure provides a sense of wayfinding as it's in the center of each level, however it also connects people to nature through biophilic design. For this reason, lighting was a crucial part of the structure. To light the small space without overwhelming vistors, I used surface mounted lighting that highlights the space. This also draws the eye to the main area of each level.

daylight harvesting system

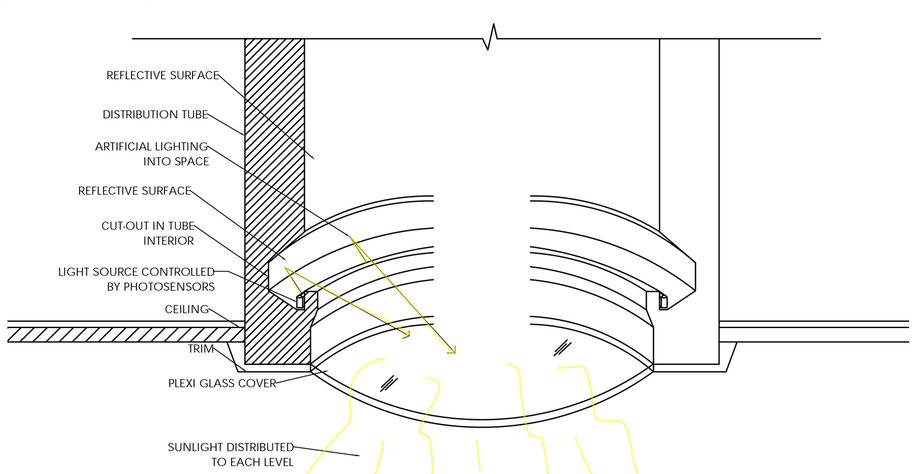
Daylight harvesting is a significant innovation that is important in creating a sustainable, energy efficient building. In this custom system, sunlight rays from any angle can be collected through triangular structures on the rooftop. The top of these structures are made from dimensional glass so that they can collect the most daylight possible. These structures are cooled by natural ventilation on each side to avoid overheating, especially in warmer climates. Inside of these structures are distribution tubes that go to each floor that can provide daylight to underground levels. Inside the tube on each floor is built-in artificial lighting that can turn on by photosensors when daylight is no longer available as the main light source. Through this system, daylight and artificial lighting can work harmoniously in one system.



Exterior Rendering



Daylight Harvesting System Sketch



Distribution Tube Interior Detail Drawing

Image	Code	Symbol	Description	Manufacturer/ Model	Lamp	Mounting	Remarks	Layers
	DH		Daylight Harvesting System	Custom Design	LED	Ceiling	Photo Sensor incorporated	General
	SL		Suspended Light Fixture	Eaton / Converge Suspended Luminaire	LED	Ceiling	4000K; Photo Sensor incorporated	Task
	RL		Recessed Light Fixture	Eaton / 340-6 LED DL Series	LED	Ceiling	Photo Sensor incorporated	General
	RL2		Recessed Light Fixture	Eaton / VAL Valet LED Tunnel E03	LED	Ceiling	4000k	General
	SU		Surface Mounted Light Fixture	Eaton / 4VT3 LED	LED	Ceiling	4' Length; Photosensor incorporated	General
	RL3		Recessed Light Fixture	Eaton / LD4B	D2W	Ceiling	With D2W option: fixture warms from 3000-1850K, Photosensor incorporated	General
	STL		Strip Light Fixture	Eaton / Metalux ST1 LED Strip Catalog #: 2STTL1040R	LED	Surface mount	4' Length	Accent
	CL		Cove Light Fixture	Eaton / LC32-LED	LED	Wall	1' Length	Accent
	SU2		Surface Mounted Light Fixture	Eaton / Metalux LW LED Wrap	LED	Ceiling	Photo Sensor incorporated	Task
	PL		Pendant Light Fixture	Eaton / Shaper 1400 L30 Performance Pendant	LED	Ceiling	CRI value: 80, 3000K (located in Sleeping Pods)	General
	WL		Wall Mounted Light Fixture	Eaton / ASXY2 WM S1	LED	Wall	4000K, 80 CRI	Accent
	PH	n/a	Photosensor Device	Eaton / Analog Photo Sensor	n/a		Connected to daylight harvesting system	Control
	CL	n/a	Room by room control. Located on each level.	Eaton / 7-ControlKeeper TouchScreen - CKT	n/a	Wall	Photo Sensor incorporated with manual override.	Control

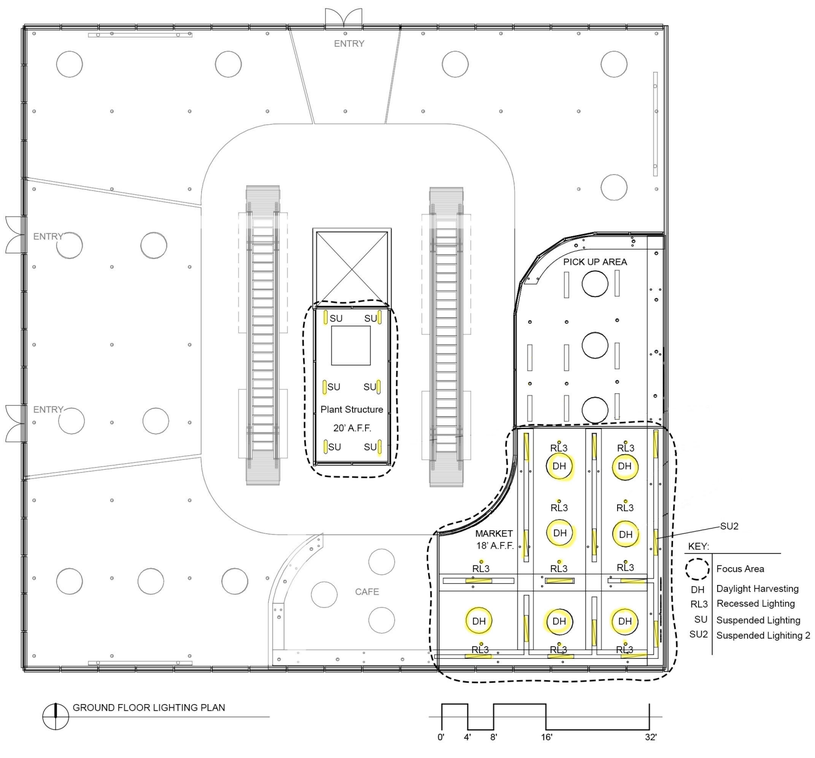
Fixture Schedule

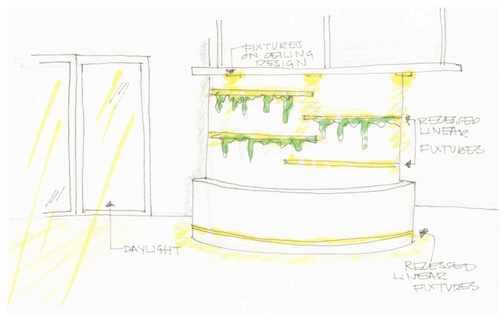
Area	Room Brightness	Light Power Density
Market	With Daylight Harvesting distribution tubes: 72 fc Without D.H. : 65 fc	0.93 W/ sq.ft.
Sleeping Pods	35 fc	0.48 W/ sq. ft.
Subway	With Daylight Harvesting distribution tubes: 56 Without D.H. : 50 fc	0.88 W/ sq. ft.

Note: Daylight Harvesting System saves 15% of energy when in use.

Room Brightness Calculation

market





Market Light Map Ideation

Market Space

The ground floor is where the main entry and the market is located. The purpose behind the market is to create a convenient location where commuters, travelers, and visitors can easily grab groceries and go to their next destination, without having to walk across the street.

The lighting for this space not only imitates daylight, but also attracts customers to the fruits and vegetables. This is important as even in a transportation hub, the market should feel clean and fresh. The ceiling design also allows for flexibiliy with various diaplays. The horizontal structure is cut into so that light fixtures could potentially be moved or added in if it is needed. In addition, strip lighting along the bottom edges of the display create an ambience of a fresh and clean market, and provides wayfinding for customers. Recessed fixtures are placed in the ceiling for general lighting. Daylight harvesting fixtures are placed throughout the market's ceiling so that in the daytime, energy can be conserved.

1 The ceiling design imitates transportation, and meeting at an intersection. However, this is also the location for surface mounted lighting which is recessed into the structure. This allows for flexibility in the market so that if lighting needs to be added, or changed it can move on the tracks recessed in the design.

2 A focal point in this space is the accent wall on the left side as customers enter. To lead customers around the space and also have another connection to nature, panels with greenery are put on the wall, which are lit with LED strips inside.

3 Strip lighting is placed around recessed portions of the displays, creating a feeling of safety and a sense of wayfinding.

4 The cash wrap area includes undercabinet lighting to appeal to our photometrics and direct people to that space.

sleeping pods

Sleeping Pods

Sublevel One and Two hold sleeping pods and ticketing stations. The sleeping pods were an important focus as it can help relieve the stress of traveling and give visitors a sense of calm and rest. The sleeping pods are constructed in hexagonal shapes that maximize the space and create a feeling of community and home. Each pod is customizable based on individual preferences. Lighting in the space aims to enhance the design of a restful space where a traveler can unwind, and even feel like they are at home.

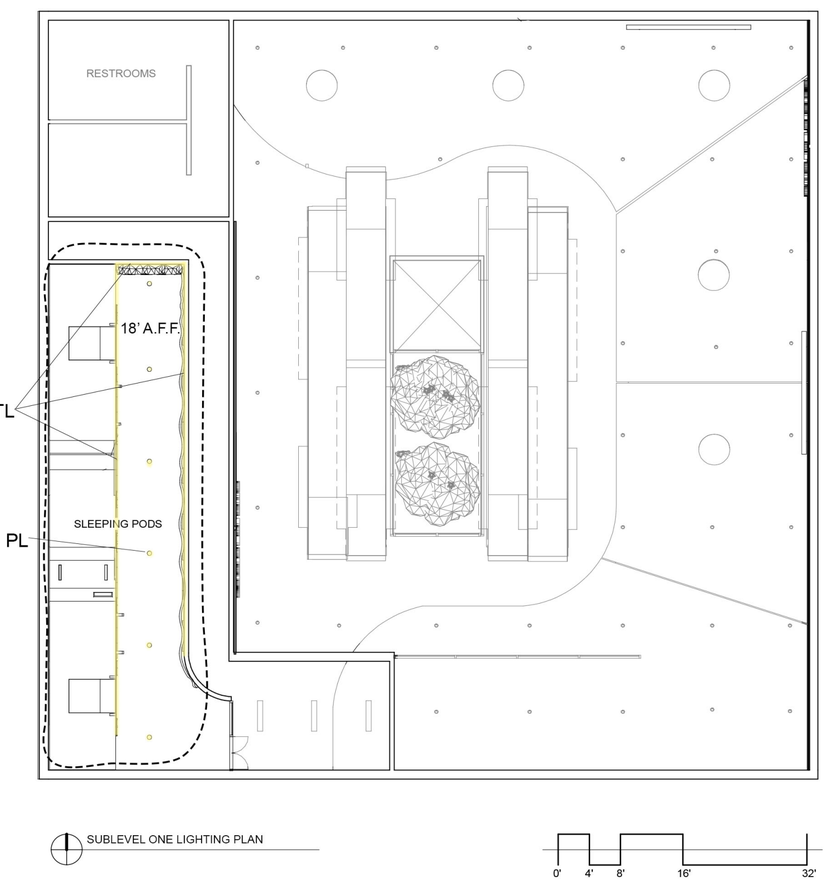
1 Strip Lighting is placed on the edge of the sleeping pods to create a cozy ambience, creating a restful space where people can relax after long hours of traveling.

2 Retractable steps are illuminated when they are in use. Lighting is focused on the edge of the steps creating a feeling of safety.

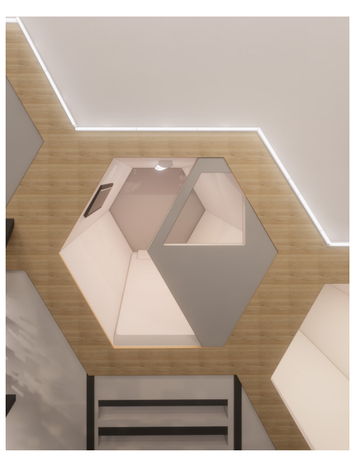
3 Pendant lighting illuminates the corridor for general lighting and continues the rhythm that the hexagonal shape of the sleeping pods create.

4 The green wall at the end of the corridor not only provides a focal point, but also connects users to nature, while connecting the sleeping pod space to the rest of Mini Metropolis. This wall is lit through strip lighting on the edges, to draw the eye towards it. The light fixtures also provide energy for the plant life, by using the concept of horticulture LED lighting.

5 An acoustic curtain on the right side is well lit by strip lighting and creates a calming environment.



Cool Lighting Customization



Warm Lighting Customization

A design feature included in the sleeping pods is the ability for users to customize their pods based on personal preference. Both lighting and temperature can be adjusted on the tablet on the left interior of the pod. In the example on the left, a pod is set to cool lighting, while the right side is set to a warm setting.

This helps users to feel in control in a space they might not feel that, and to have a better, restful experience as they set their own lighting and temperature.

subway

Sublevel Four is the location of the subway, as well as the market kiosks. An important aspect of this level was creating a feeling of safety through the use of lighting. Many subways that exist today have lighting that does not support or encourage the user of the environment. In my design, I wanted to provide sufficient lighting, and lighting that mimicked daylight as this can improve the energy and health of users as the move in the space. The layering of light helps to separate this small space from the rest of the subway level.

1 Daylight harvesting distribution tunnels are increased on this level as it is the furthest underground and will need the greatest supply of sunlight.

2 Suspended lighting fixtures provide general lighting and guide people towards the subway entry, and vice versa.

3 LED light strips placed on the escalator help to connect the building element to the rest of the space. Recessed fixtures underneath the escalator help to psychologically separate the space from the rest of sublevel four.

4 On the floor, LED light strips provide a sense of wayfinding for users and reflect on the idea of intersecting paths through transportation. They also add interest to a space that can sometimes lack interest.

5 Wall mounted down lighting on the transportation schedule screen directs people to the needed information.

Subway Seating Area

Subway Entry