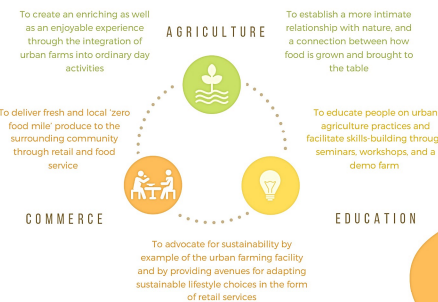


MUNTI COMMERCIAL URBAN FARM

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2018-00923
Arch 143 MSNOP
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ARCHITECTURAL DESIGN CONCEPT FUNCTION

At the heart of Metropolitan Manila, Munti brings agriculture as an intimate part of city life. The urban farm seeks to redefine the norm and pave the way for the future with its renewed approach to food production. With the integration of commercial and educational elements, it not only reconnects people to our nation's agricultural roots but endows them with the skills we once possessed. By including the farm in ordinary day activities, every experience is enriched with the understanding that these once separate concepts can co-exist within the same space. It breaks the perceived barrier between the once rural concept of farming and the city, bringing nature closer to home.



In line with this, the design of the building is intended to evoke biophilia. It seeks to create opportunities for interaction with nature as it makes use of organic material and naturalistic elements. This provides an added layer to the experience of every space, making for a unique and engaging environment. The building also invites people in by opening the space through the manipulation of building form, and the configuration of interior spaces.

LIGHTING CONCEPT OBJECTIVES

- The lighting design should be able to accomplish the following objectives.
- Clearly communicate the function of a space
 - Enhance user experience and elevate the design of the building and its spaces
 - Enforce Circadian Rhythm and a connection with nature
 - Allow the performance of tasks with ease and at desired levels of accuracy
 - Minimize energy consumption while delivering optimized performance

STRATEGIES

- Provide energy-effective luminaires by careful selection of type, model, and distribution.**
Maintaining illumination at appropriate levels ensures the ease and quality of the performance tasks. It also helps avoid visual discomfort as a result of excessive or lack of light. This is while making the energy-efficient choice of a luminaire with the best performance for the least amount of energy.
- Maximize natural daylighting through building form, programming of spaces, incorporation of daylighting elements, and the use of lighting controls.**
The use of daylighting is set in line with the concept of biophilia. Allowing the entry of natural light enforces the circadian rhythm, an innate biological connection with nature. It also minimizes energy consumption by reducing the amount of illumination needed for spaces supplemented by daylight. This is to be considered in the lighting design through lighting controls. If done effectively, it may even eliminate the use of artificial lighting for some spaces during the day.
- Utilize the Task-Aimable approach for lighting layout whenever possible and effective for the type of space.**
This ensures task lighting is optimized for the activity -with the light source brought closer to the task and made to adapt to its specific geometry. With required light levels reduced (for both general and task lighting) and with light sources distributed to allow more opportunities for energy conservation, the use of this approach makes for a more energy-efficient design and allows for lower operation costs.
- Assign proper color temperature, color rendering capacity, and other qualities of light to spaces through the selection of lighting fixtures.**
Applying specific qualities to light helps in communicating a space's use or function. This is accentuated with its typical application and observed psychological effects. In this way, it also enhances user experience by setting the appropriate mood for enjoying or engaging in the set activity.
- Use lighting fixtures as design elements through their specific selection and arrangement, such as in a layered lighting composition.**
The appropriate choice of fixtures and their design can help communicate the use of a space more clearly with the character they impart to a space. Light has the ability to elevate the design of a space. It can do so by accentuating architectural elements, layering visuals, and providing points of interests. Their specific qualities also contribute also have a part to play in creating experiences.

COMMUNICATE. ENHANCE. & CONSERVE.

MUNTI SITE DEVELOPMENT

ORIENTATION

The relative shape of the building is oriented along the East-West axis, maximizing daylight from the South through most of the year. The building's configuration also helps shield the opposite flank from direct exposure to the hot morning and afternoon sun. Instead, spaces facing the site interior benefit from indirect sunlight from the North, significantly minimizing heat gain. This also allows these areas to be more evenly lit. This is true for most of the tasks with the exception of months around June, in which case, the higher altitude of the sun is anticipated by the exterior corridors acting as overhangs.

Shear cores are placed at the free ends of the main mass. This is to protect the East and West faces of the building from direct solar radiation, with restrooms and fire exits functioning as "heat" buffer zones.



RELEVANT DAYLIGHTING STRATEGIES GREENHOUSE HYDROPONIC FARM

Harnessing natural sunlight concentrated in the South, the building increases its height towards the rear of the site. This maximizes sun exposure on the two largest facades of the building. Direct sunlight is welcomed by four consecutive storeys of full-height windows. This serves as lateral lighting for the integrated Greenhouse Hydroponic Farm, a vertical farm spanning most of the building's height. For this reason, the glass facade is left exposed to meet the required sunlight for plant growth.

Heat gain is addressed in several ways. For the glass facade, low-emissivity glazing is used to allow the virtual transmission of sunlight while blocking unfavored UV and infrared radiation. This allows for improved thermal insulation while doing very little to inhibit plant growth. The entry of light is then softened by the rotating rack structures, with its series of horizontal members functioning as interior baffles. This shields the interior spaces from excessive sunlight and glare. Lastly, the space itself is designed to counter heat gain by making use of the stack effect. The greenhouse forms a vertical pocket at the building's periphery which effectively serves as a heat buffer. It insulates the interior spaces by capturing heat in the same way a double pane window does. The space is then provided with an exhaust and climate control system, as well as awning windows at the top to allow for the natural release of hot air in the absence of electricity.

BILATERAL LIGHTING

For every storey above the ground floor, bilateral lighting is achieved with the greenhouse hydroponic farm and single-loaded corridor. Sandwiched between the two are interior spaces, most of which benefit from full-height windows that maximize the entry of light. Towards the atrium, the windows are effectively provided with a 195-meter overhang by the corridor above. Meanwhile, the greenhouse insulates and protects the interior spaces from the other side of the building while still providing daylight. The main mass also limits the building depth to 15 meters. Considering the prescribed depth of 6 meters for daylighting, there is only an additional 3 meters in excess when taking into account bilateral lighting.

SKYLIGHTS & EXTERIOR CORRIDORS

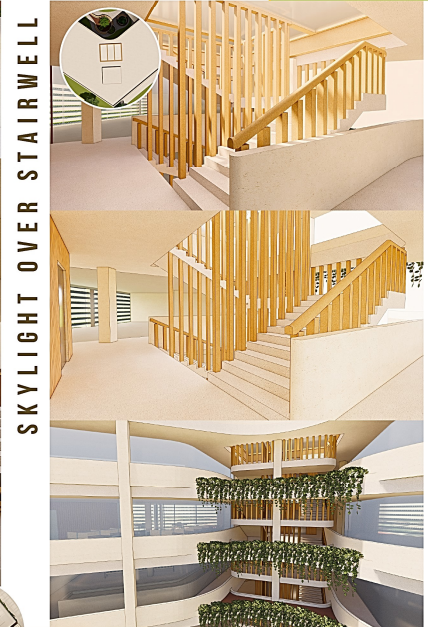
Natural daylighting is utilized for main circulation spaces. It is maximized to service large areas, including hallways, stairwells, and atriums. Munti features 3 skylights, one for the main stairwell, another for the lobby atrium -which also includes a stairwell, and the last for the retail store hallway. The skylights make use of polycarbonate sheets that are effective in insulating heat and diffusing light. While without a skylight, the central garden is an open-air atrium that similarly benefits from daylighting. Meanwhile, exterior corridors are used to facilitate horizontal circulation on each floor. With only half-halls, it affords effective daylighting for the development's main horizontal circulation spaces. In all cases, the need for supplementary light in these areas is significantly reduced. For this purpose, artificial lights for these areas are to be provided with photocells paired with dimmers to adjust illumination to required levels.

TRANSLUCENT CANOPIES & EXTERIOR ROOFS

Similar to skylights, canopies and other exterior roofs make use of polycarbonate sheets. Given their translucent appearance, durability, and insulating properties, exterior spaces are adequately shaded and protected from rain without fully blocking off natural daylight. This similarly reduces the need for supplementary light for large areas.



LOBBY ATRIUM & SKYLIGHT



SKYLIGHT OVER STAIRWELL



COVERED WALK

GARDEN ATRIUM

RESTAURANT INTERIOR SPACE

LIGHTING CONCEPT

The lighting of the restaurant is to make the space appear as an extension of the greenhouse hydroponic farm. In line with the concept of Munti, its design intends to enforce people's connection with nature and attune their circadian rhythm to promote overall well being. For this purpose, light is made to mimic or complement nature as well as to communicate the passage of time within the daily cycle.

Light is also used to create 'spaces' within the restaurant, catering to different experiences within the restaurant. This will depend on time and the assigned table. The booths are made more intimate and cozy, while the group tables are made to feel spacious and uplifting.

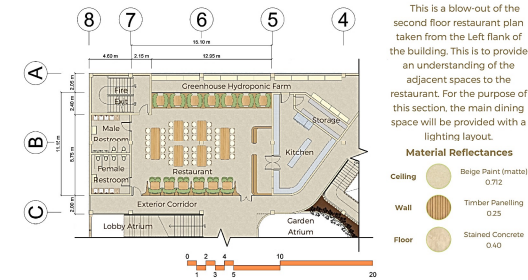
LIGHTING DESIGN APPROACH

A task-ambient approach is chosen for the restaurant's lighting layout. The main dining space is provided with ambient lights for general lighting, supplemented by task lighting over selected and required areas.

Ambient lights are to provide a uniform wash of light over the entire area, creating the baseline for the lighting scheme. This is to meet sufficient light levels to facilitate movement through the space. Task lighting is then provided for the counter to facilitate the work of servers and the cashier, and over tables for customers to read menus and dine comfortably. Additional accent lighting is incorporated through architectural elements such as coves and other fixed elements. These are to highlight forms and to add character to the space. Both ambient and accent lights are to complement daylighting in quality but not necessarily in intensity, maintaining a lower illumination so as to create a desired ambience.

Lastly, necessary light controls are used to achieve a time-appropriate atmosphere for the restaurant and to contribute to a more energy-efficient design.

FLOOR PLAN



This is a blow-out of the second floor restaurant plan taken from the Left flank of the building. This is to provide an understanding of the adjacent spaces to the restaurant. For the purpose of this section, the main dining space will be provided with a lighting layout.

Material Reflectances

- Ceiling: Beige Paint (mate) 0.72
- Wall: Timber Paneling 0.25
- Floor: Stained Concrete 0.40

ILLUMINATION LEVEL REQUIREMENT & OTHER STANDARDS ILLUMINANCE CATEGORIES AND VALUES

Area	Illuminance Category	Type of Activity	Illuminance Values		Reference Work Plane
			Footcandles (fc)	Lux (lx)	
Food Service Facilities					
Dining Areas					
Cashier	D	Performance of crucial tasks of high contrast or large size	20 - 30 - 50	300	Illuminance on task
Dining	B	Simple orientation for short temporary visits	5 - 7.5 - 10	50-100	General lighting through spaces
For tables with higher furniture	C	Working spaces where visual tasks are only occasionally performed	10 - 15 - 20	100-150	General lighting through spaces
<small>Source: Hospitality Lighting Design Guide (https://www.conceptlighting.com/docs/hospo018.pdf)</small>					
<small>*Note: Accounts for easier reading of menus, especially for larger groups that may take longer to order; lower illumination value for dimmable lights</small>					

WEIGHTING FACTORS

Illuminance Category	Factors	Value	Characteristic	Weighting Factor	Total	Application
B	Room & Occupant Characteristics	-				
	Occupant Ages	-	Under 40	-1	(+1)	Use the middle value (7.5 fc or 80.7 lx; 72 lux)
	Baseline Condition	-	Under 65	+1		
	Inclusive of Senior Citizens	-	Over 65	+1		
	Room Surface Reflectances	-45.4%	30 - 70%	0		
D	Task & Worker Characteristics	-	Under 40	-1		Use the lowest value (20 fc or 215.3 lx)
	Worker's Ages	-	Not Important	-1	-2	
	Speed and/or Accuracy	-	30 - 70%	0		
	Reflection of Task Background	50%	(for office work)	0		
C	Room & Occupant Characteristics	-	Over 65	+1		Use the middle value (15 fc or 161.5 lx; 125 lx)
	Occupant Ages	-	30 - 70%	0	+1	
	Room Surface Reflectances	-45.4%	30 - 70%	0		

*Note: Consider only 1 occupant age. Use 'under 40' for the baseline condition, and 'over 65' when computing for additional illumination requirements for senior citizens; in both cases 80.7 lux is the set minimum. Use Category C as basis of minimum illumination.

RECOMMENDED LIGHT LEVELS

Authority	Room Type	Illumination (lux)
IESNA	Cafeteria - Eating	200-300 lux
CIISE	Staff Areas	200 lux
	Restaurants & Canteens	200 lux

Use a light level between 200-300 lux as the higher end illumination value for additional lighting.

STANDARD APPLICATIONS FOR RESTAURANTS

Temperature & Conditions	Measurement Value or Quality	Description
Color Temperature	Color Temp. 2700K - 3000K (2700K - 3000K)	Best warm light for restaurant with ambient light
	1000K Kelvin	Warm white with a bit of yellow color; good for dining and social atmosphere
	3000K Kelvin	Warm white with a bit of yellow color; good for dining and social atmosphere
	4000K Kelvin	Neutral white with a bit of blue color; good for dining and social atmosphere
Color Rendering	Between 90 and 100	Good for general lighting and task lighting
	90 and above	Good for general lighting and task lighting
	Around 100K - 200K	Good for general lighting and task lighting
	200K and above	Good for general lighting and task lighting
Lighting Control	0.5 to 1.0	Good for general lighting and task lighting
	1.0 to 2.0	Good for general lighting and task lighting
	2.0 to 3.0	Good for general lighting and task lighting
	3.0 to 4.0	Good for general lighting and task lighting

*Note: CRF (CRI) is the preferred condition to be considered in the lighting design of the restaurant. Source: https://www.conceptlighting.com/docs/hospo018.pdf

ILLUSTRATED DAYLIGHTING STRATEGIES

CALCULATIONS

DATA

I = 15.10 m **hfc = 0.75 m**
W = 11.15 m **hrc = 0.00 m**
h = 2.80 m **hrc = 2.80 m - 0.75 m = 2.05 m**
A = 168.365 sq. m.

E = 80.7 lx **pc = 0.712 or 71%**
n = 1 **pw = 0.25 or 25%**
LL = 900 lm **pf = 0.40 or 40%**

DETERMINING RCR, CCR, & FCR

RCR = [5 hrc (1 + w)] / (1 x w)
 = [5 (2.05 m) (15.10 m + 11.15 m)] / (15.10 m x 11.15 m)
 = 1.598090458 or 1.60

CCR = RCR (hcc / hrc)
 = 1.60 (0 / 2.05)
 = 0

FCR = RCR (hfc / hrc)
 = 1.60 (0.75 / 2.05)
 = 0.585365857 or 0.59

EFFECTIVE REFLECTANCES

***Notes: pw = 25%**
 For **pc'**, use **pc = 71%**, & **CCR = 0**
pc' = 0.66

 For **pf'**, use **pf = 40%** & **FCR = 0.59**
pf' = (0.43 + 0.26) / 2
 = 0.345

COEFFICIENT OF UTILIZATION

Take note of the following values:
RCR = 1.60 ***Coefficient of Utilization table is unable in the specification sheet, obtained CU is in reference to a previously provided table (lecture 12, page 13)**
pw = 0.25 or 25%
pc = 0.66 or 66%
pf = 0.345 or 34.5%

CU = [(0.92 + 0.78) / 2]
 = 0.85 or 85%

LIGHT LOSS FACTOR (LLF)

LLD = 0.80 (taken from a model with similar specifications)
LDD = 0.94 (for open fixtures with light dirt level)
BF = 1.0 (for LED products)

LLF = 0.80 x 0.94 x 1.0
 = 0.752

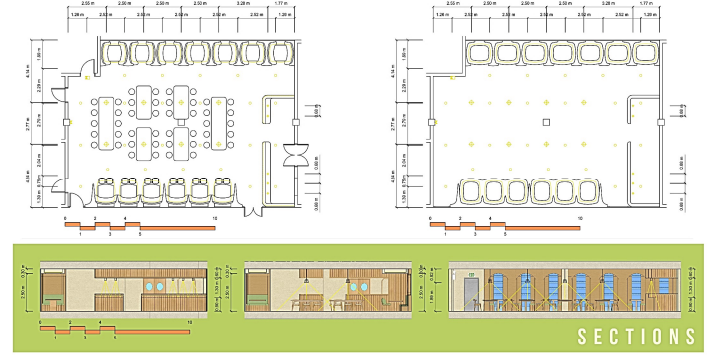
LIGHTING CLASSIFICATION

Layer	Classification	Mounting	Placement	Illumination provided	Ambient light via Illumination
Ambient Light	Downlight	Recessed	General Area	80 lux (min.) 7'	100%
Task Light	Pendant	Suspended	Over Tables	125 & 250 lux	64% & 32%
Task Light	Pendant	Suspended	Over Counter	215 lux	34%
Accent Light	Strip Light	Surface mounted	Cove	(Indirect)	--

Layer	Type of Fixture	Brand	Series and Model	Wattage	Rated Life	Brightness (Lumens)	Distribution (Beam Angle)	CRI	Color Temperature (Kelvin)	Additional Notes
Ambient Light	Downlight	NaturalLED	LED2CL-R9.0L CCR	12W	80000h	900, 900, 900, 900	Fixed 110°	90	2700, 3000, 3000, 4000, 5000	Dimmable, Color, Dimmable
Task Light	Pendant	50+ Lighting	SE-350-149	17W	L70 @ 25000h	1600, 400, 450	270°	90	3000	A21 Shy-shy dimming, independent replacement, to be provided housing to limit angle at 50°
Task Light	Pendant	NaturalLED	LED2PUC-CL103S 9.0x16K	18W	50,000	1,300	33°	90	3000	With 300mm and 600mm options for mounting
Accent Light	Strip Light	Diode LED	LEAZ-Linear LED Strip Light	45W	50000h	300 per foot (90 per meter)	120°	90	3000	with MicroDM™ Electronic Dimmable Driver

*Sources: <https://www.mprated.com/naturalled-spec-engineer/93620/20LED0LR-90LS3CL.pdf>
<http://www.lighting.com/specs/241691659.html>
<http://www.mprated.com/naturalled-spec-ftp/PC-L-774-217-w.pdf>
<https://www.bulbs.com/product/DIAT50-6C200M0-1000>

LIGHTING LAYOUT AND REFLECTED CEILING PLAN



TOTAL NUMBER OF FIXTURES

N = E x A / (n x LL x LLF x CU)
 = 80 lx x (168.365 sq. m.) / (1 x 900 lm x 0.752 x 0.85)
 = 23,432,944 or 24 downlights

Symbol	Legend	Symbol	Legend
○	Recessed Downlight	—	LED Striplight
⊕	Pendant Light 1	⊕	Pendant Light 1
⊕	Pendant Light 2	⊕	Pendant Light 2
⚡	Emergency Light	⚡	Emergency Light
⚡	Illuminated Emergency Sign	⚡	Illuminated Emergency Sign

RECOMMENDATIONS

STRATEGIES IN TYPE AND PLACEMENT

- Use slim disk downlights for general lighting purposes. This requires less depth for mounting, maintaining a higher ceiling height. Its small surface, recessed mounting, as well as larger beam angle make for a less conspicuous appearance. The latter also improves its ability to provide a uniform wash of light and reduce the occurrence of shadows. This makes it a effective choice for general lighting as an unperceivable source of light.
- Areas adjacent to sources of natural daylighting can be provided with lower illumination through the use of indirect lighting such as cove lights. Cove lights replicate the indirect appearance of daylight and is made to supplement natural light with dimmable optics, making for a more energy efficient design. Towards the evening, the booths serve as low light areas providing a more intimate space for diners. The cove itself helps communicate the separation of space and partly confines the booth to make it cozy. However, it is important to ensure that minimum light levels are met.
- Use pendant lights in areas where higher levels of illumination are required, especially those that do not benefit from daylighting. This includes tables at the center of the room and the counter. Made to accommodate larger groups, the tables become areas of increased activity and groups are likely to take longer when placing an order. As such, higher light levels are provided to match this energy and to better facilitate the reading of menus. It is also important to consider optimizing the beam angle, either with the specified light source or with your chosen design of pendant light. In the case of the restaurant, the beam angle is restricted to 90 degrees so as to confine most light over the table and place rays above the line of sight to avoid glare.

SPECIFICATIONS

- Vary color temperatures between 3000K and 3500K to complement natural daylight, enhance the color of food, and create moods. General lighting and cove lights are provided with a color temperature of 3500K to achieve a neutral white that resembles daylight. This makes the restaurant appear as an extension of the greenhouse farm. It enforces a connection with nature, contributing to a person's well-being. General lighting shifts to 3000K as the day passes and to 2700K when wanting to create a more romantic atmosphere in the evening. Pendant lights are then provided with 3000K, distinguishing the space with a slight contrast and making the food look its best.
- Specify lights with a high color rendering capacity of 90 or above. This is essential with a restaurant and with the particular aim of Mumi as a development. A high CRI brings out the true color of food and highlights the quality of produce from the farm. In this way, it fosters a new found appreciation for food and the process in which it is grown and ultimately brought to the table.
- Choosing dimmable lights provides the opportunity of varying light levels throughout the day. Bright light is utilized in the morning, moderate light at noon and the afternoon, and low light towards the evening and onwards. This helps set an appropriate mood and atmosphere for each time of the day while also communicating the passage of time that enforces a person's circadian rhythm.



GARDEN ATRIUM EXTERIOR SPACE

LIGHTING CONCEPT
 Serving as an interface between nature and daily life, among Mumi's prominent features is the garden atrium. To invite people to lounge and use the space for leisure, the garden is protected from direct sunlight at times when it is most severe. Towards the evening, it is to be provided with artificial lighting that endows the space with an entirely new character.

ILLUMINATION LEVEL REQUIREMENTS & OTHER STANDARDS

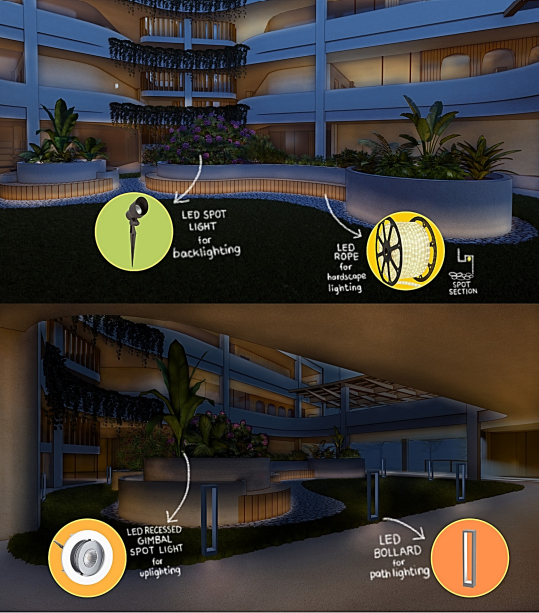
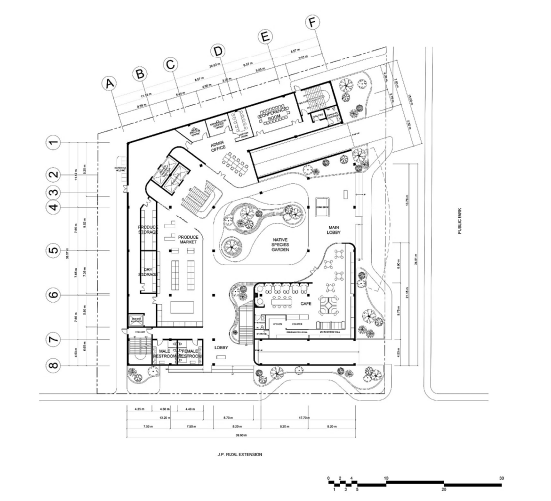
Authority	Circulation Areas	Room Type	Illumination (lux)
CBSE	Atria with Plants		500 - 3000

Property	Application
12-100	Strip Lights
100-200	Chalk Lights
50-185	Wall Lights
50-185	Hardscape Lights (on walls)
30-200	General Landscape Lights or Atmospheric Landscape Lights
120-800	Landscape Spotlights
200-600	Landscape Floodlights
120-180	Underwater Lights or Pool and Pond Lights
100-180	Lamp Posts
300-700	Security Lights or Motion Sensor Lights
700-1500	Flood Lights
10-15°	For tall, thin structures or foliage like the grazing deer or porch columns
12°	Ideal for flagpoles, very tall palm trees, some columns, and other tall narrow objects: light concentrated in a narrow cone provides extremely high luminance - select lower surface lamps if needed
12-24°	generally used to illuminate formal stone columns, chimney tops, top peaks, and gables
24°	Best used on tall narrow objects such as columns and narrow trees; avoid projecting onto wide surfaces as it may seem overly artificial
25-45°	For medium height and width, such as a porch tree light for general accent lighting; lampstands, porches, or points straight up to the roofs of tree-trunk houses. Also used to illuminate grand trees for tall, especially palm trees
36-36°	Ideal angle to use when lighting between structures on the front of a house, or when the object to be illuminated is not overly wide
50-50°	For short, wide items the beam sides are other, wider structures
50-65°	usually useful for level 1 moonlighting
60°	with a wide angle for fountains, plant material, and application for a fairly wide coverage avoids the projection of an obnoxious cone of light - gives a more natural appearance
80°	for flooding walls with light, or any application that needs a wide exposure of light
85-100°	Ideal for wall washing and grazing wide objects; wide lighting used for all level 1 lighting walls; best used to light big, wide, low-to-the-ground hedges and bushes, retaining walls, cultured walls, stone walls with a texture, that are normally wide 100 ft. or has a wide base to be illuminated at ground level

Note: Spotlights are the preferred conditions to be considered in the lighting design of the Garden Atrium
 Source: <https://www.energizeind.com/how-many-lumens-should-i-choose-for-outdoor-landscape-lighting/>
<https://www.bulbs.com/blog/indoor-outdoor-how-many-lumens-do-you-need-for-outdoor-lighting/>
<https://www.walpole.com/blog/outdoor-landscape-lighting-for-different-landscape-lighting-design/>
<https://www.lighting.com/blog/pros-and-cons-of-adjusting-beam-angles-for-landscape-lighting-design/>

FLOOR PLAN

The central garden is set at the heart of the development, surrounded by other spaces. On the ground floor, this includes the cafe, the produce market with mini-grocery, and the admin office. The covered walk on the following floor also opens below, providing a view of the garden from above.



SPECIFICATIONS

Layer	Type of Fixture	Brand	Series and Model	Wattage	Rated Life	Brightness (Lumens)	Distribution (Beam Angle)	CRI	Color Temperature (Kelvin)	Additional Notes
Uplighting	Spotlight	Diode LED	SFOT-MOD	2.1W	50000h	169	32°	90	3000	Recessed, Adjustable, Dimmable
Backlighting	Spotlight	Diode LED	SFL-30K5H-6GR	5W	-	240	60°	>80	3000	Spike Mounted, Adjustable
Hardscape Light	Rope Light	Green Watt	GR-2WR-150F-TWW	8.80W (per 3')	25000h	-	120°	80	2800	Dimmable, Highest grade PVC with UV inhibitor, Heat Resistant
Path Light	Bollard	Hikile Group	Pilum	10	-	546	52°	83	3000	Against light pollution, Diffused light, Medium Beam

CONCEPTUAL DRAWINGS

*Sources: <https://www.bulbs.com/product/DI-SPOT-RG2-30-32-BA> (<https://www.superbrightleds.com/moreinfo/led-landscape-spot-lights/>)
<https://www.bulbs.com/product/GR-2WR-150F-TWW>
<https://www.bulbs.com/product/DI-SPOT-RG2-30-32-BA>
<https://www.bulbs.com/product/GR-2WR-150F-TWW> (<https://lightbulbsplus.com/products/150-ft-warm-white-led-rope-light-spool-1-2-120-reel.html/>)
<https://www.bulbs.com/industry/product/pilum/>



RECOMMENDATIONS APPROACH AND STRATEGIES

- **Make use of low lighting to create an atmosphere while reducing ecological impact on surrounding areas.**

In keeping lighting fixtures at a low level, attention is held to one's immediate surroundings as opposed to an overhead light source. Without heavily relying on top lighting—as streets and commercial areas often do, the area is taken as it is without having to feel heavily manufactured or artificial. Instead, a careful use of combined spotlights, rope lights, and bollards ground the space as a part of nature that's simply provided with lights. It creates a setting predominated by the scene of the night. Beyond this, this approach also takes great care in minimizing light trespass by keeping light within the confines of the space.

- **Utilize uplighting and backlighting as methods of illuminating focal points.**

Going for a low lighting approach, experiences are to be created for this point of view. This involves bringing focus to the immediate surroundings. Particularly for plants, these methods can imbue it with an added charm. Backlighting provides plants with a luminous glow, while uplighting highlights particular ones by directly illuminating them. A combination of the two and their deliberate placement enhances the landscape and complements its composition.

- **Incorporate lighting into site furniture.**

Site furniture can offer many opportunities for the incorporation of light that can greatly transform a space from its daytime appearance. It is best to design them with the intention of incorporating light. In the case of the plant boxes with integrated seating, it is provided with a recessed base that allows the installation of LED rope. This illuminates the furniture along with the surrounding area, including the pebbled garden. The LED rope is also provided protection from water and tampering by this hidden nook.

- **Use a fixture's light footprint and direction of light to aid orientation.**

Light can be used as orientation devices when fixtures are chosen and placed with intention. In the case of the garden atrium, bollards placed along its periphery serve as markers of its entry and exit. Its particular design allows for a seemingly non-obstructed view into the garden and makes use of light to direct people in and out of the space. The latter of which is facilitated by the dual direction of light and its orientation towards and away from the garden. Apart from this, it serves as path lighting as well as general lighting.

- **Balance brightness with beam angles for effective illumination of subjects and mitigation of light trespass and pollution.**

In line with a low lighting approach, it is important to avoid over-lighting and light spillage. Lower intensities are paired with narrow beam angles. This is to address how narrow beams concentrate brightness through greater distances. By limiting lumen output, focal plants can be highlighted without illuminating much of the sky. Meanwhile, higher intensities are paired with wider beam angles. This is to ensure that enough light is provided for illuminated bushes and shrubs while diffusing it across a larger area to produce a noticeable glow.

SPECIFICATIONS

- **Specify lights with mechanisms for light control to mitigate light trespass and pollution.**

Spot lights are provided with a tilt function that allows light to be freely directed towards a chosen subject. This can help in their strategic placement and positioning so as to avoid light spillage. Narrower beam angles, likewise, limit the area serviced by the light and can be effectively diffused by the object being illuminated. Bollards also direct light laterally, with a design that cuts off light below the horizontal. The intensity of light is also diffused and paired with a medium beam angle, reducing the instance of disability glare and excessive light.

SUMMARY

- **Lighting Concept**

The use of lighting is to make the restaurant appear as an extension of the greenhouse. Its design is to enforce people's connection with nature, and to hone in on their circadian rhythm with the intent of promoting their well-being. As such, it is to complement light in nature and communicate the passage of time alongside the daily cycle.

Light is also to create 'spaces' within the restaurant, catering to different experiences depending on the time and assigned seating. Booths are to feel more intimate and cozy while tables at the center of the room are to feel spacious and uplifting.

- **Lighting Design Approach**

A task-ambient approach is chosen for the restaurant's lighting design. Ambient lights are to provide a uniform wash of light over the entire area, creating the baseline for the lighting scheme. This is to meet sufficient light levels to facilitate movement through the space and to be supplemented by task lighting over required and selected areas. This includes the counter and tables at the center of the restaurant intended for larger groups. In addition, accent lighting is to be incorporated through architectural elements so as to highlight forms and to elevate the restaurant's design. This is all paired with the use of lighting controls to achieve a time-appropriate atmosphere and to contribute to a more energy-efficient design.

- **Lighting Layout and Specifications**

An array of 23 slim disk downlights are used as ambient lighting for the main dining space. This is to provide the required 80 lux for general lighting. A wide beam angle of 110 degrees is used to flood the area with a uniform light. This is supplemented by 8 pendant lights set over larger tables at the center of the room. This is able to provide an illumination of 250 lux in the morning and 125 lux towards the evening, effectively adapting its brightness to the time of day. Its light is restricted to a beam angle of 90 degrees, setting its rays above the line of sight to avoid glare. This also mostly confines the light over the table. A different set of pendant lights is provided for the counter. With higher intensity and narrower beam, it serves as task lighting to provide 215 lux for facilitating the work of the cashier and servers. Meanwhile, accent lighting takes the form of concealed strip lights in coves and under countertops. The prior makes use of indirect light that bounces off the ceiling, providing additional illumination for booths. These booths are brightened during the day with available daylighting, and then kept in low light for a more intimate atmosphere towards the evening.

For all fixtures, LED technology is utilized for its energy-efficiency and quality of light. Brightness varies depending on application but most of the units are dimmable, with the exception of the pendant lights for the counter. Color temperature is mostly kept within the 3000K to 3500K range so as to appear neutral and complement daylighting. However, general lighting can vary between 3500K for morning, 3000K for midday to evening, and even 2700K for particularly romantic nights. All lights also have a minimum color rendering capacity of 90, taking great care in making the food look its best.

SUMMARY

- **Orientation**

Munt's massing features increased height towards the rear of the site. It harnesses sunlight from the South over a large surface for the greenhouse hydroponic farm while shielding public circulation areas and interior spaces from direct sun exposure. This is paired with an angled configuration which features adjoining flanks that shield each other from the hot morning and afternoon sun. Spaces, such as the greenhouse, fire exits, and restrooms, similarly act as heat buffers at the East and West end of the building.

- **Greenhouse Hydroponic Farm**

The greenhouse benefits from lateral daylighting through four consecutive storeys of full-height windows. This facilitates the growth of produce, mostly favoring sun-loving plants that thrive in direct sunlight. As the sun path shifts towards June, the greenhouse is provided the opportunity of growing plants which benefit from indirect sunlight instead.

The Greenhouse Hydroponic Farm is well-designed to address heat gain with the specification of low-e glazing, the application of the stack effect, its effective function as a heat buffer, and the installation of climate controls, ventilation systems, and awning windows. Meanwhile, the rotating rack structures span the height of the building serve as interior baffles and shielding devices for the building's interior spaces.

- **Bilateral Lighting**

Bilateral lighting is achieved with the greenhouse hydroponic farm and single-loaded corridor set on either side of the building's interior spaces. The two spaces protect the interior envelope from heat gain and direct sun exposure respectively. In turn, most interior spaces are provided with full-height windows to maximize the entry of light. Building depth is also limited to 15 meters to allow light to reach most of the interior.

- **Skylights & Exterior Corridors + Translucent Canopies & Exterior Roofs**

Natural daylighting is utilized for main circulation spaces and maximized over large areas. Skylights service the lobby atrium, the main stairwell, and the retail store hallway. These make use of commercial-grade polycarbonate sheets that insulate heat and diffuse light. Exterior spaces are likewise provided with roofs and canopies of the same material. Main horizontal circulation for each floor is then facilitated by single load corridors set along the site interior. Below this is an open-air atrium that similarly benefits from natural daylighting. In all cases, supplementary lighting is provided with photocells that are paired with dimmers so as to only provide light at required levels as a response to available daylighting.

ANALYSIS

With limited space and the required scale of the development, Munt does well to balance maximizing site occupancy with taking full advantage of natural daylight for its spaces. Its massing and space programming are directly informed by the sun path. As such, it is able to provide light of a desired quality for specified spaces direct and prolonged exposure for the greenhouse, and indirect and diffused light for interior spaces.

The choice of skylights, atriums, and full-height windows are also commonplace for most commercial developments. The incorporation of these elements, among others, is also consistent with a biophilic design as it makes use of natural daylight as a prominent feature of the development. This greatly defines the character of its serviced spaces and contributes to an overall sense of improved well-being when inside these spaces.

In maximizing daylighting for large areas and pairing it with effective light controls, Munt's approach to daylighting likewise translates to energy-efficiency and reduced operation costs.

ANALYSIS

The variation in lighting fixtures and their effective layering clearly communicate the space's use as a restaurant. Lights give the restaurant an added personality, accentuating the architecture of space and its forms. In combination, these define subspaces that are designed to communicate a different feel. Light is also designed to complement daylight, reflecting its changes throughout the day by adjusting illumination and color temperatures. In this way, people are brought in harmony with nature and their innate circadian rhythms. Overall, light creates these experiences through both time and space.

Beyond experiences, this varied approach to light provision also contributes to energy savings. It ensures that light is provided where it is needed and only in required amounts. It makes use of more energy-efficient options such as LEDs and employs energy-saving lighting controls such as dimmers and photocells.

EVALUATION ACROSS ALL LEVELS, THE LIGHTING DESIGN IS ABLE TO ACHIEVE ALL SET OBJECTIVES

- ☑ Communicate function
- ☑ Enhance user experience and design
- ☑ Connect with nature and attune circadian rhythm
- ☑ Facilitate performance of task
- ☑ Be energy-efficient

This defines the overall performance of the lighting design with respect to the set objectives of the project. It also serves as the criteria for analyzing the site development, restaurant, and garden atrium.



- **Lighting Concept**

During the day, the garden benefits from the shade provided by the building which invites its use. In the evening, however, lighting is to endow the space with an entirely different character from its daytime appearance. The beauty of the landscape is to be highlighted by the use of light, creating focal points and lending foliage a certain glow. It is to illuminate the area sufficiently to invite its use and to orient people in and out of the space. In both look and function, lights should draw people in and be brought closer to nature. This is all while reducing, if not fully avoiding, causing any sort of impact on the surrounding environment.

- **Lighting Design Approach**

The design combines landscape and hardscape lighting in elevating the experience of the space. Landscape luminaires are provided as backlighting and uplighting for plants. Spillage of light is to be avoided through their proper selection, careful orientation, and placement. Hardscape lighting is to be incorporated in highlighting site furniture. To further delineate the garden from the surrounding circulation space, lights are to be set along its perimeter. Apart from marking points of entry, these illuminate the slight change in elevation and the transition into a different ground material. Its conveyed light should be able to direct people into the space while also contributing to the space's general lighting.

The design uses low lighting that maintains the appearance of night. Without top lighting, the space is rooted to the ground level which translates into something more tangible. This choice, likewise, does well in reducing light trespass and pollution.

- **Lighting Layout and Specifications**

Spotlights illuminate the landscape through a combination of uplighting and backlighting techniques. Uplighting highlights taller and vertical plants as focal points, while backlighting is employed for shorter and wider shrubs and bushes. For uplighting, spotlights provide 169 lumens through a narrow 32 degree beam angle and are carefully aimed to minimize light spillage. In concentrating light on a particular plant, it sets it apart from the rest of the arrangement. A wider 60 degree beam angle with a higher lumen output of 240 is then used as backlighting. This higher intensity produces substantial levels of diffused light, creating a glow that appears to come from within the plants' branching shape.

Rope lights are installed under site furniture, nightlighting them as landscaping elements and also illuminating the surrounding pebble garden. Bollards set along the garden's periphery also contribute to the general lighting of the space. With a higher lumen output of 546, it conveys diffused light in two directions. This lighting footprint allows it to become an effective orientation device, facilitating the entry and exit of people in and out of the space.

The use of low lighting and color temperatures ranging from 2800K to 3000K achieves a more organic look. It maintains the appearance of night, with light simply illuminating specific areas for visibility and beauty. This creates an atmospheric feel that invites people in and encourages them to lounge as they take in the space. The intentional use of uplighting and backlighting techniques then put into focus the landscape and plants, making nature the atrium's most prominent feature. Together, helps identify the use of the space as a garden for leisure.

Lights are also carefully selected in their specifications and design, taking well note of its suitability to its intended use and performance in terms of minimizing light spillage. While energy consumption is significantly lowered by the low lighting approach, the use of LED technology and low wattages likewise contribute to a more energy-efficient design.