Busko

PASIG CITY URBAN FARM COMMERCIAL ECO-TOWER

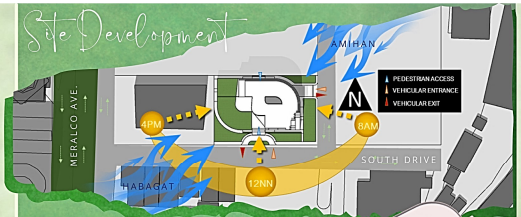
The project aims to support the vision of Pasig City to be a future Ecopolis City, as an urban farming facility in Metro Manila, and a symbol of:

SUSTAINABILITY
Low-impact and resilient architecture

PERMEABILITY
Adaptability and openness to the immediate environment

LINKAGE
Weaving together the users of the spaces

Site Development



ORIENTATION AND SUN PATH

- Oriented along the **EAST-WEST AXIS**
- Long side is **facing SOUTH - NORTH**
- Major spaces are concentrated in the **NORTH/EAST** portion of the building to avoid the extreme heat from the west sun; buffer spaces such as balcony, open corridors, and decks, are situated on the West side.

FORM

- Semi-elliptical in shape with **openings at the center that act as light and air wells** to encourage natural ventilation and daylighting
- Each layer is **layered and tapering** in form to also increase light penetrability

Lighting Design Goals

The project is envisioned to provide an environment that promotes growth and nourishment - an airy, restful, and balance lighting design.

PRODUCTIVITY AND EFFICIENCY IN DESIGN
by ensuring enough lighting for different functions, harnessing the daylight, and integrating efficient artificial lighting solutions that are economical and well-planned

PROMOTE INTERACTION
in social spaces and provide security by establishing a well-lit environment

INSPIRE PHYSICAL AND PSYCHOLOGICAL WELLNESS
in the design of a quality environment, with the provision of aesthetic design, symmetry and consistency in lighting, and emphasis on user comfort

Daylighting Strategies

TOP LIGHTING

- **Light wells** that extend to the basement allow daylight into the navel of the building, larger from the upper level, tapering to the lower levels

MULTILATERAL SIDE LIGHTING

- **Tall glass windows** along the perimeter of interior space encourage more daylight and even out illumination along multiple sides.
- **Window area** is ensured to be >20% of the floor area in major areas such as the Café
- **Overhangs act as shelf reflector** that reflect the light towards the ceiling
- **Use of low-e and photovoltaic glass** for insulation and energy harnessing, also reduces sunlight glare

SURFACE FINISHES

- **Materials with higher material reflectance** are mostly used in the interior, lower reflectance materials are used as accents to delineate space

CEILING		WALL		FLOOR	
70-90%	10-15%	70-90%	20-50%	35-50%	10%
MAJOR White Paint	MINOR Dark Wood	MAJOR White Paint	MINOR Low-E PV Glass	MAJOR Light Wood	MINOR Concrete Tile

SUNSHADING

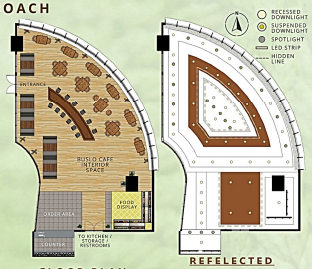
- **Combination of operable stainless steel vertical louvers and horizontal overhangs** (also act as light shelf reflectors) are used especially for the major spaces such as the Café along the North East side of the building

RUBY ANN MAMANGUN
ARCH 143 THNOP
PROF. ROSALIE FLORES-BERNARDO

Busko Café : FARM-TO-TABLE EXPERIENCE IN THE METRO

DAYLIGHTING APPROACH

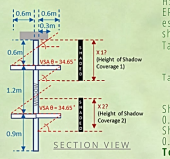
Open form, permeable spaces, light wells, multilateral side lighting with windows of optimal dimensions, and high reflectance surface finishes were implemented to maximize daylighting. The major spaces were oriented away from the West sun. Sun shading solutions and overhang from upper levels are used to reduce unwanted heat gain.



FLOOR PLAN | REFELECTED CEILING PLAN

SUN SHADING CALCULATIONS

Sun shading for the Café is designed for partial shade; since the room is oriented in the north east direction, the sun shading provided is of eggcrate design.
The overhang (that also acts as reflective shelf) provides the majority of the shading at around 67%. The vertical louver fins add around 10% shading and acts as diffusers to reduce glare.



SECTION VIEW

TYP. OVERHANG

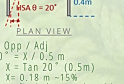
At June 21, 8AM
FACING EAST = 90.0° (WORST)
AZI = 70°, ALT = 33°
HSA = 20°, VSA = 34.6533°,
EPA= 62.23° - not used for the estimate of eggcrate oriented shading.

Tan 34.65° = X / 0.3m
X = Tan 34.65°(0.3m)
X = 0.2 m

Tan 34.65° = X / 0.6m
X = Tan 34.65°(0.6m)
X = 0.4 m

Shadow Coverage 1, X 1:
0.2m + 0.4m + 0.4m = 1.0 m
Shadow Coverage 2, X 2:
0.4m + 0.4m = 0.8m
Total Ht. Shaded=1.8m~67%

VERTICAL LOUVERS



PLAN VIEW

Tan0= Opp / Adj
Tan 20° = X / 0.5 m
X = Tan 20° (0.5m)
X= 0.18 m ~15%
However, fin is louvered and is partially passable by light
Effective Width Shaded= 10%

The main purpose of the vertical louvers is to act as diffusers to reduce glare.

ARTIFICIAL LIGHTING DESIGN APPROACH

Task-ambient approach is applied in the design of the Café where **general ambient illuminance** is initially set to blanket the space, using diffused light from recessed downlights. Warm temperature of lighting envelops most of the space for a cozy, relaxed ambience. Additional **task illumination** is employed on work planes such as tables and counter tops, and **accent lighting** on displays and recessed spaces are added to accentuate the desired spaces. LED lamp solutions were preferred because of their energy efficiency and economy.

ILLUMINATION LEVEL REQUIREMENTS

Illumination level requirements for the Busko Café is at 200-300 Lux, according to IESNA standards.

LIGHTING SPECIFICATIONS

Recessed downlights are used to supply the general lighting of at least 100 lux around the café. Suspended pendant lamps are used to illuminate the task surfaces and achieve the additional 100-200 lux. For accents, spotlights are employed for focal lighting, and LED strip lights are installed on recessed surfaces for decorative lighting.

LUMINAIRE RECOMMENDATIONS

DOWNLIGHT
Philips GreenSpace
DN461B LED11S/840 DIA-VLC-E C ELP3 WH P

Luminaire light beam spread - 120°
Dimmable - Yes
Initial luminous flux (system flux) - 1100 lm
Initial LED luminaire efficacy - 121 lm/W
Initial input power - 9 W
Init. Corr. Color Temperature - 4000 K
Init. Color Rendering Index - >80
Lumen maintenance at median useful life of 50000 h - L80

Busko Café : FARM-TO-TABLE EXPERIENCE IN THE METRO

PENDANT TASK LIGHT
Philips GreenSpace
Accent Pendant
PT320T 17S/PW930 PSU WB CP WH

To be customized with accent housing material
Beam angle of light source - 120°
Luminaire light beam spread - 24°
Dimmable - No
Initial luminous flux (system flux) - 1700 lm
Initial LED luminaire efficacy - 114 lm/W
Initial input power - 16.4 W
Init. Corr. Color Temperature - 3000 K
Init. Color Rendering Index - ≥90
Lumen maintenance at median useful life of 50000 h - L80

SPOTLIGHT - WIDE BEAM
Philips GreenSpace
Accent Projector
ST321T LED27S/840 DIA-VLC VWB BK

Beam angle of light source - 120°
Luminaire light beam spread - 54°
Dimmable - Yes
Initial luminous flux (system flux) - 2700 lm
Initial LED luminaire efficacy - 115 lm/W
Initial input power - 23.5 W
Init. Corr. Color Temperature - 4000 K
Init. Color Rendering Index - >80
Lumen maintenance at median useful life* 50000 h - L80

SPOTLIGHT - MEDIUM BEAM
Philips GreenSpace
Accent Projector
ST321T LED19S/ROSE PSU HMB FG BK

Beam angle of light source - 120°
Luminaire light beam spread - 24°
Dimmable - No
Initial luminous flux (system flux) - 1900 lm
Initial LED luminaire efficacy - 93 lm/W
Initial input power - 20.5 W
Init. Corr. Color Temperature - 2200 K
Init. Color Rendering Index - >80
Lumen maintenance at median useful life* 50000 h - L80

LED STRIP
Philips Master LEDstrip
21.3W827 2400LM/M 5M and
21.3W965 2450LM/M 5M

Light source color - depends on driver
Constant light output - Yes
Dimmable - Yes
Initial LED luminaire efficacy - 112/115 lm/W
Initial input power - 81 W
Init. Corr. Color Temperature - 2700/4000 K
Init. Color Rendering Index - 80
Median useful life L70B50 - 60000 h
Overall length - 5000 mm

CALCULATION OF TABLE TASK ILLUMINATION

Beam angle of light source - 120° (unrestricted)

Height of luminaire - 1.75 m
Height of table - 0.75 m
Table to luminaire distance = 1.0m
Initial Luminous Flux = 1900 lm

Area Illuminated = π x [(1.0 m) x Tan(60°)]^2
= 9.42 sqm

Illuminance, E = 1900 lm / 9.42 sqm = 202 lux

Note: The luminaire housing is restricting the light spread to 24°; thus, the resulting illumination coverage at the table is about 0.45m in radius.

Analysis, Summary and Recommendations

SITE DEVELOPMENT

The orientation of the building along the West - East Axis, with the long sides facing the North and South, and the placement of the major spaces on the North/East - part of the building minimized the unwanted heating from the low-angled West sun.

The light wells integrated at the center of the building and the open corridors increased the amount of sunlight that goes into the building. The sunlight from the top floor can effectively penetrate down to four floors, and increases ambient lighting to the lower floors.

The tapering form of the building adds to the amount of natural light that can reach the lower floors.

INTERIOR MAIN SPACE

Multi-lateral sidelighting across the room perimeter was the main mode of daylighting for the Café and it effectively allowed even illumination into the interiors throughout the day.

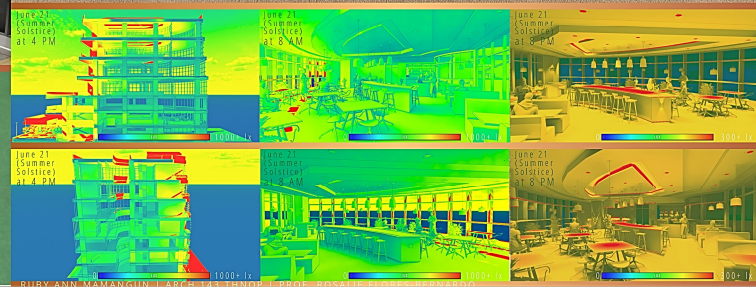
Materials of high reflectance which were chosen for the surface finishes and the window overhang that double purposed as a reflective shelf helped to increase the reflected light within the Café.

Employment of eggcrate sunshading along the Café windows partially blocked the unwanted heat from the sun, especially from the low-angled, hot rays from the East at 8AM-10AM. The vertical louvers also acted as diffusers that reduce glare.

Artificial lighting was employed to illuminate the space during the evening. The use of task-ambient approach helped to reach the minimum illumination needed, while maintaining the restful ambience and avoiding over-illumination. The additional pendant lights filled up the lighting requirement for the task. Spotlights and LED strip lights were set as accent lights to emphasize the desirable spaces.

OVERALL EFFECT OF LIGHTING IN DESIGN

Lighting enhances the overall character and aesthetics of the building. It helps define the form and the function of the building by designing in support of the activities and tasks to be catered to in the spaces as well as using it in support of the architectural design goals.



CALCULATION OF AMBIENT LIGHT USING LUMEN METHOD

Room area = 210.5 sqm
Perimeter = 60.35m
height of ceiling = 3.0 m
height of work plane = 0.70 m
E = 200-300 lux (1/3 to 2/3 for ambient lighting = min 100 lux
pc = 80%
pw = 30%
pf = 30%
n = 1 downlight with 120 deg light spread
LL = 1100 lm
LLD = 0.80
LDD = 0.94 for enclosed & light dirt environment

Getting the Zonal Cavity Heights
h CC = 0
h RC = 2.30
h FC = 0.70

RCR = (2.5x h RC x P1) /(A2)
RCR = (2.5)(2.3 m)(60.35m)/(210 sqm)
RCR = 1.65
CCR = 1.65 (0 / 2.30) = 0
FCR = 1.65 (0.70/2.30) = 0.50

Effective Reflectance
Ceiling - pcc
using pc = 80%, pw = 30% and FCR = 0(interpolate in table 6.6.2)
p cc = 76% or 0.76

Floor - pfc
Using pf = 30%, pw = 30% and FCR = 0.50
(interpolate from 0.4 & 0.6)
p fc = (28+26)/2)
p fc = 27% or 0.27

Estimated Coefficient of Utilization:
Direct fixture or downlight - 85%

LLF = LLD x LDD x BF
LLF = 0.85 x (0.88 x)
LLF = 0.75

N = (E x A) / (n x LL x LLF x CU)
N = [(100 lux) (210.5 sqm)]/
[(1x1100 lm x 0.75 x 0.85)]
N = 30.01 ~ at least 31 fixtures for at least 100 lux