DESIGNING MODERN BUILDING FAÇADES

Ar. Carmelo Casas
The façade of a building is the first impression that suggest that the structure has something special to offer. A representation of the architect’s creative vision and desire to impress with something unique and out of the ordinary.
Case study 1 | LPU
Davao

ADAPTIV

Site conditions and building orientation
Local traditions

Complimenting color palettes
Case study 2 | LPU

Davao

University Campus

Located in a Planned Unit Development (PUD)

Projected occupancy of 10,000 students

Target date of completion: June 2019

Developed by Lyceum of the Philippines University
Site Development

Masterplan

UTILITIES

JPL BUILDING

RESIDENTIAL

ENTRANCE

SHL BUILDING

COMMERCIAL BUILDING

PARKING

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Site Analysis

Shadow study
Sit Analysis

Shadow study

East & West facades most exposed.

Vertical fins in courtyard will also benefit southern exposure.
Temperature control
Simulations

Daylight Factor

Glare (visual comfort)

Illuminance (incl. artificial lighting)

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Façade study

Cultural references | Local traditions

Recognizing the founding pioneers, and early inhabitants, emphasizing their SHARED HISTORIES, CULTURAL HERITAGE, TAPESTRY OF TRADITIONS, and their decades-old, harmonious, Ten tribes. Three cultures. One Mindanao.

10 colour zones referencing the tribes of Davao & festivals of Mindanao
Ata | Matigsalog | Ovu Manuvo | Djangan | Tagabawa | Tausog | Maguindanao | Maranao | Kagan | Kadayawan | Kailangan

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Façade study

Cultural references | Local traditions
Exterior Lighting
Exterior Lighting

Lighting Study
Exterior Lighting

Lighting Study | Scheme 2
Facade Studies

Section | Facade Study

1. Aluminium profile shading system
2. Low-emissivity glass curtain walling
3. Projecting edge to classroom module
4. Roof overhang provides solar shading & wind collection
5. Solar Panels
Facade Studies

Section | Facade Study

TAILOR-MADE OPTIMIZED PUNCH WINDOWS

TAILOR-MADE OPTIMIZED STICK-TYPE CURTAINWALL

TAILOR-MADE OPTIMIZED UNITIZED CURTAINWALL

TAILOR-MADE OPTIMIZED LOUVERS
Integrated Approach to Design and Engineering

We believe that the building envelope, like the human skin, is an important interface that provides protection, comfort and aesthetics.

Finding the right balance between different systems of the building is absolutely essential for effective & efficient contemporary projects.
Design Considerations

Integrated approach to design and engineering

**Short-Term Costs / Investments (CAPEX)**

» tailor-made design & cost optimized facade solutions
» optimized inexpensive right-sized internal systems of the building
» lower costs for operations and maintenance (energy costs)
» maximization of GFA
» easy and safe cleaning of the facade
» resistance to degradation resulting to enhanced weather-tightness
» tailor-made design & cost optimized facade solutions

**Mid- and Long-Term Costs (OPEX)**

» system reliability
» architectural expression (style and look)
» ease of construction and maintenance (buildability)
» water tightness
» air tightness
» daytime aesthetics
» night-time look (“secondary architecture”)
» readability of the concept behind the design
Design Considerations

Integrated approach to design and engineering

Safety and Security
» resistance to natural disasters
» resistance to acts of aggressive and detrimental human behavior
» resistance to acts of terror
» thermal comfort of occupants
» light/daylight comfort of occupants
» acoustic comfort of occupants
» enhanced productivity and happiness

Comfort and Productivity
» interaction with people through media solutions
» possibility to increase profits through advertisement
» interaction to environment through daylighting

Relations with the Society
» Building Standard compliance (NBC, ASHRAE, ASTM, etc.)
» Green Building Compliance (USGBC LEED, UK BREEAM, PhilGBC BERDE, etc.)
» compatibility with new requirements (seamless high speed data transmission etc.)

Innovations & Compliance with newest trends
Conclusions

1. Glazing systems should be properly selected according to the building’s location to achieve the most efficient and cost-effective solution.

2. Glazing properties like U-Value, Solar Heat Gain Coefficient (SHGC) and Visible Light Transmission (VLT) have their own significant effects on building overall performance.

3. Glazing selection can significantly affect the cost, energy consumption and carbon emission of a building.

4. For a tropical climate like in Davao, Philippines, significant amounts of building loads come from solar gain compared to conduction gain which means a low U-Value is still helpful during hot days to keep the heat out, but a low SGHC is the most important window property in warm climates.
Case Study 2

Metrobank Center – Grand Hyatt

STAND OUT
Unique crown
Lighting design
Bold and contemporary color palettes

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Case Study 2 | Metrobank Center – Grand Hyatt

Mixed-use skyscraper

281.78 m

Currently the tallest building in the Philippines

Completed 2017

Developed by Federal Land Inc.
Advantages of Curtain Wall
Advantages of Curtain Wall

+ Aesthetics

Modern finish with clean lines; Glass & Aluminum are resistant to corrosion.
Advantages of Curtain Wall

+ Aesthetics
  Modern finish with clean lines; Glass & Aluminum are resistant to corrosion

+ Lightweight
  Fast and easy installation on site
Advantages of Curtain Wall

+ Aesthetics: Modern finish with clean lines; Glass & Aluminum are resistant to corrosion

+ Lightweight: Fast and easy installation on site

+ Structural Performance: Span multiple floors while dealing with factors like thermal expansion, contraction, water-diversion, building sway & movement effectively
Advantages of Curtain Wall

+ **Aesthetics**
  Modern finish with clean lines; Glass & Aluminum are resistant to corrosion

+ **Lightweight**
  Fast and easy installation on site

### Structural Performance
- **Transparency**
  Span multiple floors while dealing with factors like thermal expansion, contraction, water-diversion, building sway & movement effectively
- **View is maximized & bring in light which reduces lighting power consumption**
Metrobank Center
Grand Hyatt uses
Insulated Glass Units

Also known as Double / Triple Glazing, IGUs consisting of 2 or 3 window glass panes separated by a vacuum or glass-filled space, hermetically sealed
Insulated Glass Units

- Glass
- Spacer
- Desiccant
- Polysulfide
Metrobank Center—Grand Hyatt uses unitized system.
UNITIZED SYSTEM

Unitized systems are pre-fabricated in modules off-site and delivered in panels.
Why use unitized system for Metrobank Center–Grand Hvatt?

1. Due to the large size of the project and a lot of repetition of the glass panel modules, the said system are better able to exploit the benefits of factory condition manufacturing.
2. Another advantage is high quality control, due to tight tolerances of fabrication in a climate-controlled environment.
3. Unitized system requires lower installation time on site, thereby decreasing field labor. The system can be installed in a third of the time of a stick-built system. The bulk of unitized system storage is off-site, which is advantageous for tight job-sites.
One of the design considerations of the curtain wall is the building movement caused by **Seismic** and **wind forces**.
The Metrobank Center–Grand Hyatt curtain wall uses performance-based design.

Wind tunnel study results were used in the design.

Wind affects drift of the building.
def. a structural system for a tall building that uses a central core of concrete, with massive horizontal concrete beams that provide stability against wind loads.
Storey drift is a horizontal movement of a floor level relative to the bottom floor level.

High-rise Buildings have higher inter-storey drift than shorter buildings.

Since the curtainwall is anchored floor to floor of the building, the curtainwall connection has to be flexible yet strong enough to move with the displacement of the building without incurring damage.
The Metrobank Center–Grand Hyatt has **viscous dampers connected to outriggers** in the middle of the tower.
The outrigger with the dampers reduces the vibrations induced by both strong winds and earthquakes.
Because of the **Outriggers** with the **Dampers**, the inter-storey drift and acceleration of the building was **reduced dramatically**, lessening the stress on the connections of the curtain wall to the structure.
Crown

Spire Truss

Crown Truss

Structural steel truss

Wind forces are based from results of Wind Tunnel Test

Connected to the concrete frame at the base at el. 251.2m
Concrete filled steel section with radius ranging from 650mm at the base to 275mm at the tip
Analysed against vortex shedding risk
Base supported by a 2m thick beam at L66
With cross brace at el. 251.765m
Spire
Designers can turn IDEAS into REALITY with the help of modern technology, new building materials, and knowledge of specialty consultants.
Thank you!

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