LEED REQUIREMENT & SUSTAINABLE BUILDING STRUCTURE

by

Mr. Hasan Baig
Director & Group Managing Partner
FCD GROUP

FAÇADE CONCEPT DESIGN GROUP

HASAN BAIG

Technical Director of FCD Group

Managing Director FCD Middle East

*With **38 Years** of work experience in the field of Façade Design, I had been a part of several renowned projects globally in many countries of Europe, Middle East & Asia.*

After pursuing a degree in Mechanical Engineering and serving 5 years in India for Hindustan Aeronautics Limited, I ventured in the field of façade with Swiss companies ALU-SUISSE & SCHMIDIN in the Europe and Alupco, ALICO & ALU-NASA in the Middle East & SP fab in India. I I I have also been involved in Facade Designing programs, workshops and conferences.

During the 38 years long carrier in facades ,I have worked on all conceivable types of projects, establishing strong relationships with professionals and companies from all round the globe.

Determined to advance façade innovations and technologies. I have developed cutting-edge façade systems which have been used on many internationally recognized projects.

A few to name here below:

- *King Faisal Military City, Khamis Mushayat, Saudi Arabia.*
- *Ministry of Defense HQ, Riyadh, Saudi Arabia*
- *Riyadh Islamic University, Riyadh, Saudi Arabia*
- *Aramco Campus (many buildings) Jubail, Saudi Arabia*
- *Sandoz Building Basel, Switzerland.*
- *Kupka Paris, France.*
- *Prospects West, Croydon London, United Kingdom*
- *Glaxo campus Stevenage, United Kingdom*
- *MOD headquarters buildings Bristol, United Kingdom*
- *Swiss-Re London, United Kingdom*
- *Farringdon street London, United Kingdom*
- *London Heathrow Terminal 3 (Extensions, pier 5 & 6) United Kingdom*
- *London Gatwick Pier 6 & Bridge, United Kingdom.*
- *Edenbara airport, Scotland, United Kingdom*
- *Burj Khalifa, Dubai UAE*
- *Jumeirah Beach Hotel & Resort, Dubai, UAE*
- *Burj-Al Arab, Hotel, Dubai, UAE*
- *Palaces of Sultan of Brunei. Brunei Dar as Salam*
- *National Bank of Dubai HQ building, Dubai, UAE*
- *Raheja Tower, Madras (Chennai) India*
- *Taj Hotels (refurbishment)in India*
- *Fortune 2000 Mumbai, India*
- *Hilton Hotel, (Bridge way Development) Abu Dhabi, UAE*
- *Latifa Tower, Dubai. UAE*
- *Heart of Doha Development, Phase, 1A, 1B & 1C, Doha Qatar.*
- *Burj Marina, Lusail, Doha Qatar.*
- *Lusail Multipurpose Hall, Doha Qatar*
- *Doha Bank HQ building, Doha, Qatar.*
- *Qatar National Library, Doha Qatar.*
- *Yas Island, Link Bridge, Abu Dhabi, UAE*
- *Opus, Dubai, UAE*

and many more….

LEED DEFINATION

LEED "Leadership in Energy and Environmental Design" is a rating system devised by the United States Green Building Council (USGBC) to evaluate the environmental performance of a building and encourage towards sustainable design.

USGBC is promoting sustainability through Green Buildings.

LEED REQUIREMENTS

- *Based on well-founded scientific standards, LEED emphasizes state of the art strategies for sustainable site developments water saving ,energy efficiency ,material selection & indoor environmental quality. It is becoming an increasingly important component of the building design.*

- *The importance of the building envelope in the life cycle performance of an edifice is outlined & recognized today in most of the projects aiming for a high performance construction or the green building certification, such as LEED.*

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- *For façades the assessments are melding of a technologies including thermal studies ,climate analysis ,performance data's etc.*

- *The system is credit-based allowing projects to earn points for environmentally friendly actions taken during the construction and use of a building.*

- *LEED system is introduced to accelerate the development and implementation of "Green Buildings Practices".*

- *Glass Products for building are recyclable at the end of their lives thus helps environment & comply with LEED requirement.*

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LEED CERTIFICATION

LEED certification defined in 4 levels:

- *Certified 40-49 points*
- *Silver 50-59 points*
- *Gold 60-79 points*
- *Platinum 80-110 points*

LEED BENEFITS

- *LEED is a voluntary program; however obtaining LEED certification gives a positive image to the community.*
- *Many states and government departments adopted LEED system for public and special buildings / cities; also Governments are giving tax credits / grants for green buildings.*
- *Abu-Dhabi Government has recently built complete new city "MASDAR" using LEED, implementing green buildings practices.*
- ***The major benefits of adopting green building practices are energy and cost saving over the life of the structure; in addition the buildings will be environmentally friendly.***

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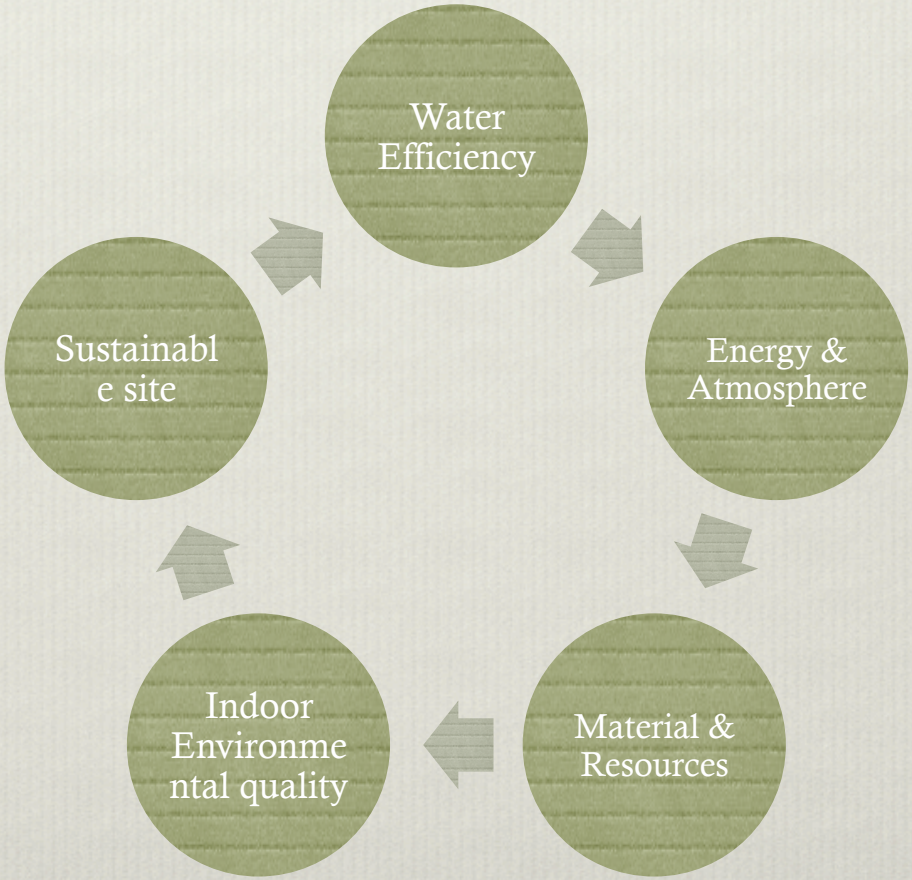
LEED STRUCTURE

The structure of LEED rating system is segmented into 5 key sections they are:

- ***Sustainable sites***
- ***Water efficiency***
- ***Energy and atmosphere***
- ***Materials and resources***
- ***Indoor environmental quality***



LEED IMPACT ON FACADE

The first 2 sections have very little impact on façade and the last 3 sections are more significant

- *Energy performance issues will impact overall design of the façade, that is: insulation, airtightness, and selection of materials to achieve high thermal values, selection of glazing to limit or maximize solar heat gains.*

- *For materials and resources, durability of components and assemblies is critical part of high quality envelops design. Materials selection based on life cycle assessments will help in achieving high quality windows, curtain walling, sky lights etc.*

- *The major credit for facades goes to indoor environmental quality. If designed appropriately the external façade this can deliver an indoor environmental quality that meets high standards, contribute to reduction of energy, noise and provide comfort to the occupants.*

- *LEED complaint / high performance external envelops must address issues of insulation, conduction, solar radiation control, infiltrations (Air & water tightness) openings, day light.*

- *Energy performance of a building can be determined depending on how these issues are dealt / approached.*

- *LEED requirements is a broad subject, in short if an external façade design complies with LEED requirements will provide ultimate comfort to its occupants and help the cause of Green & Sustainable Buildings.*

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LEED MASDAR CITY CENTRE ABU DHABI

LEED CERTIFIED PROJECTS BY FCD GROUP

Shaikh Abdullah Al Salem Cultural Centre, Kuwait

Red Line Metro Station, Thailand

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LEED CERTIFIED PROJECTS BY FCD GROUP

GATCHU, JAKARTA

PALMA-2, JAKARTA

HYATT REGENCY, THAILAND

KSPT, Thailand

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LEED CERTIFIED PROJECTS BY FCD GROUP

MahaNakhon ,Thailand
Height 314 m

IIB, Doha
Height 260m

Twin Tower, Doha
Height 208m

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LEED CERTIFIED PROJECTS BY FCD GROUP

Most complex Geometry
Kahrama Park, Doha

REC, New Delhi

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LEED CERTIFIED PROJECTS BY FCD GROUP

Corporate Empire, Kolkata
Height 120 m

NMMC, Navi Mumbai

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LEED CERTIFIED PROJECTS BY FCD GROUP

Trident Hotel, Mumbai

Courtyard Marriott Hotel, Dhaka

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LEED CERTIFIED PROJECTS BY FCD GROUP

Western Hotel Shrishti, Kolkata

Novotel Hotel, Mumbai

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SUSTAINABILITY DEFINATION

Sustainability can be defined as an ability or capacity of something to be maintained or to sustain itself forever or for a certain period. Sustainability applies to peoples, culture, environment, jobs, money, buildings, facades, interiors and almost everything of our lives.

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SUSTAINABILITY MANAGEMENT FOR BUILDING FACADE

- *Sustainability Management means creating the ability to keep a system running without exhausting the resources, maintaining economic viability and taking care of the present and future generations.*

- *Sustainable practices to be applied in all aspects of our lives by implementing or managing in a way that should benefit the current generation and future generations.*

- *Sustainable construction refers to the adoption of building designs, construction methods and materials those are environmentally friendly. It also means using materials and resources that have sustainable supplies and are readily available from many sources.*

- *Through Sustainable construction and use of natural resources (via recycling) and reuse of materials greatly benefit the society and future generations.*

- *Facades are defined as external envelop of a buildings and **sustainable buildings facades** should be designed to achieve highest level of comfort to its occupants in terms of aesthetics, thermal & acoustic performances, natural ventilation, access to natural environment, day lighting, heat loss / heat gain control, load balancing, safety etc.*

- *In modern buildings glazed facades have become an essential component to the buildings, due to its transparency qualities, colours and aesthetics etc.*

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- *Glazing allows the daylight to penetrate the interiors of the buildings also provides a view to the outside surroundings.*

- *By providing the day light and viewing to the outside, glazed facades enhance the interiors of the building and improve the comfort and feelings of the occupants.*

- *It is the responsibility of all the members of our society ,industry including developers ,designer, builder & supplier to make concentrated effort to adopt sustainable construction in their building projects.*

- *Selection of glazing for external façade can play a major role in energy efficiency of a building .Using smart glass solution/composition in an innovative way can contribute to achieve sustainable low energy building .Double & triple glazing with low emissivity coating can significantly improve the insulation properties (U value / Thermal transmittance value) also can limit or maximize solar heat gain.*

FACADE
CONCEPT DESIGN
GROUP

Our Offices & Project Locations

FCD Group has independent registered offices globally in :

INDIA India	MUMBAI , DELHI & BANGALORE	Façade Concept Design Pvt Ltd, Mumbai/Delhi,
THAILAND Bangkok	BANGKOK	Façade Concept Design Thailand Company Ltd,
QATAR Qatar	DOHA	Façade Concept Design Middle East, Doha
HONG KONG	HONG KONG	Façade Concept Design Hong Kong Ltd
PHILLIPINES	MANILA	Façade Concept Design Philippine (JBS)

Our offices have in-house teams of facade designers from diverse nationalities like Indian, Thai, Indonesian, British, Philippines', European etc.

FACADE CONCEPT DESIGN GROUP

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CONSULTING DESIGN ENGINEERING

Group Managing
Director
FCD Group

Introduction

FAÇADE CONCEPT DESIGN Group (FCD) , a company providing façade consultancy and engineering services to our valued clients like developers, architects and builders, including project owners.FCD Group is a solely owned practice that has built a reputation for delivery of projects based on our integrity and trust to our clients globally. We are Specialist in providing façade envelope solutions involving our design experts to design proper energy efficient façade with economic solutions. Our core responsibility is to select the façade systems, glass and materials correctly with respect to visual comfort, thermal satisfaction and over-all building performance.

Another division of FCD provides complete façade engineering services to the contractors globally who need design engineering outsourced with façade engineering companies. In this service we provide concept design and system design, structural calculations, shop drawings, cutting list and fabrication drawings on behalf of contractor. We are also proficient in BIM modelling if required.

FCD group has various offices globally like Bangkok, Delhi, Doha, Hong Kong, Manila and very soon to be in Dubai and Europe with various nationalities of people working, including façade experts with more than 35 years of experience. Our company has provided appreciated contribution in more than 222 no's of projects globally including High Rise tower up to 322 metres tall .We also have good amount of hotel projects with experience of working with all world reputed brands. Our clients have received tremendous benefits from our experience into diverse fields for over many years. Our team of Architects and Engineers also have experience in working on health care and medical projects in our past.

Our Group Managing Director Mr. BINOY KR. DAS, is a Qualified Civil Engineer. He has participated in several Green Building Conferences in Middle East and SEA region during past years. Our group has also carried out many LEED Certified Projects Globally. We believe in acquiring the opportunity to work globally and creating a defined opportunity for the economy of the people.

HASAN BAIG

Technical Director of FCD Group

Managing Director FCD Middle East

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and many more….

SURAPONG MEKNAVIN

Managing Director
FCD Thailand Co. Ltd.

Surapong is a Registered Professional Engineer, and a member of Engineering Institute of Thailand. Overall management of a Bangkok based consulting firm, SEA Consult Engineering Co., Ltd. Founded in 1995 the firm is a multi-disciplinary company offering a full range of project development services to clients in Thailand and throughout Southeast Asia. The firmed is registered as a Class A consulting company with the Finance Ministry of Thailand.

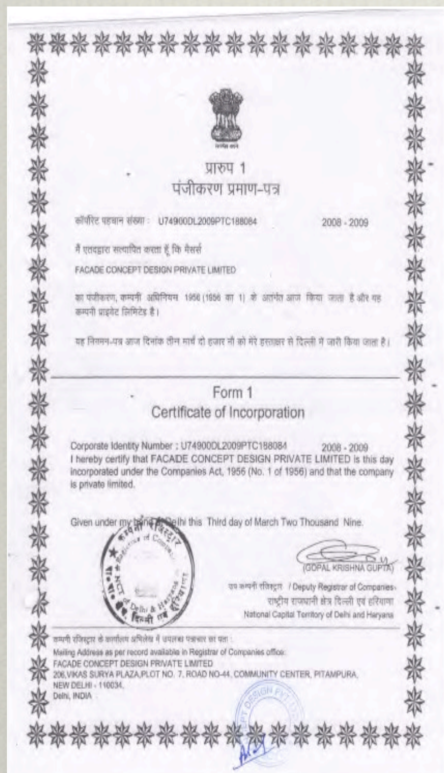
Recently joined with FCD Group to establish Façade Concept Design (Thailand) in 2013. He has personally directed the Project and Construction Management Division, and has established a team of highly qualified professional staff serving renowned clients in the region.

Educated and worked for 10 years in United States, Surapong has brought with him an international engineering standard practices to the firm. With 29 years overall experience he has been involved in all aspects of the projects from design, cost estimate to project delivery. Projects experience ranges from infrastructures, retails, commercial buildings, condominiums, and hotels.

Surapong has worked with many international strategic partners, public companies, and local government agencies.

FCD GROUP

- Façade Concept Design Pvt. Ltd. , India
- Façade` Concept Design Thailand Co. Ltd. , Bangkok
- FCD Hong kong Co. Ltd., Hong Kong
- JBS Façade Concept Design , Philippine
- FCD Dubai (Under Process)



प्रारुप 1
पंजीकरण प्रमाण-पत्र

कॉर्पोरेट पहचान संख्या : U74900DL2009PTC188084 2008 - 2009

मैं एतद्द्वारा सत्यापित करता हूँ कि मैसर्स
FACADE CONCEPT DESIGN PRIVATE LIMITED

का पंजीकरण, कम्पनी अधिनियम 1956 (1956 का 1) के अंतर्गत आज किया जाता है और यह कम्पनी प्राइवेट लिमिटेड है।

यह निगमन-पत्र आज दिनांक तीन मार्च दो हजार नौ को मेरे हस्ताक्षर से दिल्ली में जारी किया जाता है।

Form 1
Certificate of Incorporation

Corporate Identity Number : U74900DL2009PTC188084 2008 - 2009
I hereby certify that FACADE CONCEPT DESIGN PRIVATE LIMITED is this day incorporated under the Companies Act, 1956 (No. 1 of 1956) and that the company is private limited.

Given under my hand at Delhi this Third day of March Two Thousand Nine.

(GOPAL KRISHNA GUPTA)
उप कम्पनी रजिस्ट्रार / Deputy Registrar of Companies
राष्ट्रीय राजधानी क्षेत्र दिल्ली एवं हरियाणा
National Capital Territory of Delhi and Haryana

Mailing Address as per record available in Registrar of Companies office:
FACADE CONCEPT DESIGN PRIVATE LIMITED
206,VIKAS SURYA PLAZA,PLOT NO. 7, ROAD NO-44, COMMUNITY CENTER, PITAMPURA,
NEW DELHI - 110034,
Delhi, INDIA

No 0706/ 10116

Regional Revenue Office 2
Manoonpol II Bldg., 8th Floor
2884/1 New Petchburi Road,
Bangkapi, Huay Kwang,
Bangkok 10310, Thailand.
Tel : (662) 319-4668
Fax : (662) 319-3930

September 6 , 2015

Certificate of Residence

To whom it may concern :

Name of Company : FACADE CONCEPT DESIGN (THAILAND) CO.,LTD
Address : 11th Floor, Asoke Towers, 219/38 Sukhumvit 21 Road, North Klongtoey, Wattana, Bangkok 10110, Thailand
Tax Reference No. : 0105556072760

In compliance with the Agreement between the Government of the Kingdom of Thailand and the Government of the Republic of Indonesia for the Avoidance of Double Taxation and the Prevention of Fiscal Evasion with respect to Taxes on income, we hereby certify that the above company is a resident of Thailand for tax purpose. The company is incorporated and taxable under the law of Thailand since the year 2013.

This certificate is issued upon the request of the above taxpayer for whichever legal purpose it may serve.

(Mr.Verayuth Imoun)
for Director
Regional Revenue Office 2

No. 2021119

COMPANIES REGISTRY

CERTIFICATE OF INCORPORATION
公司註冊證書

I hereby certify that

FCD HONGKONG LIMITED

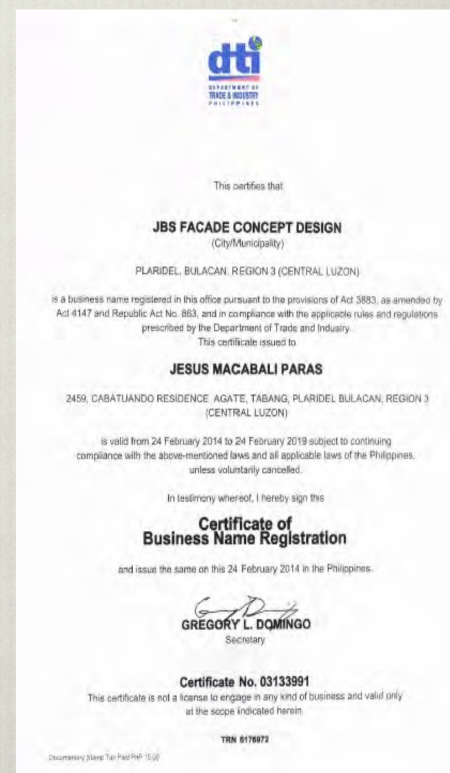
is this day incorporated in Hong Kong under the Companies Ordinance (Chapter 32 of the Laws of Hong Kong) and that this company is limited.

Issued on 3 January 2014.

Certified True Copy

Registrar of Companies
Hong Kong Special Administrative Region

Note:
Registration of a company name with the Companies Registry does not confer any trade mark rights or any other intellectual property rights in respect of the company name or any part thereof.



This certifies that

JBS FACADE CONCEPT DESIGN
(City/Municipality)

PLARIDEL, BULACAN REGION 3 (CENTRAL LUZON)

is a business name registered in this office pursuant to the provisions of Act 3883, as amended by Act 4147 and Republic Act No. 863, and in compliance with the applicable rules and regulations prescribed by the Department of Trade and Industry.
This certificate issued to

JESUS MACABALI PARAS

2459, CABATUANDO RESIDENCE AGATE, TABANG, PLARIDEL BULACAN, REGION 3 (CENTRAL LUZON)

is valid from 24 February 2014 to 24 February 2019 subject to continuing compliance with the above-mentioned laws and all applicable laws of the Philippines, unless voluntarily cancelled.

In testimony whereof, I hereby sign this

Certificate of Business Name Registration

and issue the same on this 24 February 2014 in the Philippines.

GREGORY L. DOMINGO
Secretary

Certificate No. 03133991
This certificate is not a license to engage in any kind of business and valid only at the scope indicated herein

TRN 6176972

Documentary Stamp Tax Paid PhP 15.00

Key Personnel's FCD Group

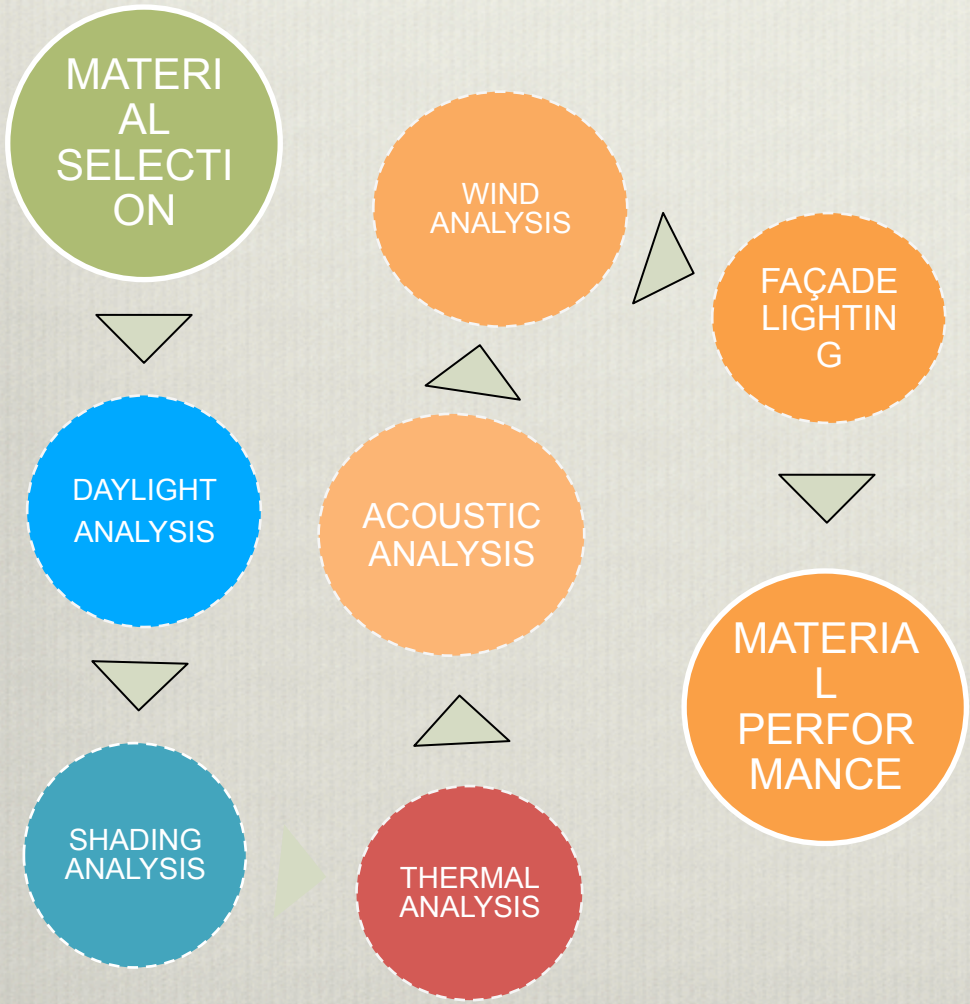





Our Services & Expertise

- *Conceptualization*
- *Façade Material Selection*
- *Material Performance*
- *Façade Lightings*
- *Façade Testing*
- *Value Engineering*
- *Building Façade Maintenance and Cleaning System*
- *Design Development , Detailing as per Typologies*
- *Completion & handover*

Performance Criteria



Material Selection

Understanding the following measures for Material Selection:

- *Architectural intent*
- *Performance Criteria*
- *Aesthetic feasibility*
- *Easy Maintenance & Safety.*

Daylight Analysis

Experimenting with the openings and reflective surfaces so that during the day natural light provides effective internal lighting.

- *The aim is to maximize visual comfort and reduce energy use.*

Shading Analysis

The design of shading devices is analysed on following measures:

- *Climatic Considerations & Utilising Seasonal Variations.*
- *Visual Comfort.*
- *Thermal Comfort.*

Thermal Analysis

A conceptual design analysis to calculate the loads due to direct and in-direct solar gains, internal gains, inter-zonal heat flow due to intermittent usage.

Acoustic Analysis

Sound Transmission Class (or STC) is an integer rating of how well a building partition attenuates airborne sound. It is widely used to rate exterior wall. The STC rating figure very roughly reflects the decibel (Db) reduction in noise that a façade can provide.

Wind Analysis

Wind Pressure estimation depends on the following measures:

- *Building Dimensions (Length, Breadth & Height)*
- *Wind Speed as per location.*
- *Class, Category & other wind parameter.*
- *External Pressure co-efficient.*

DAYLIGHT ANALYSIS

Working Hypothesis:

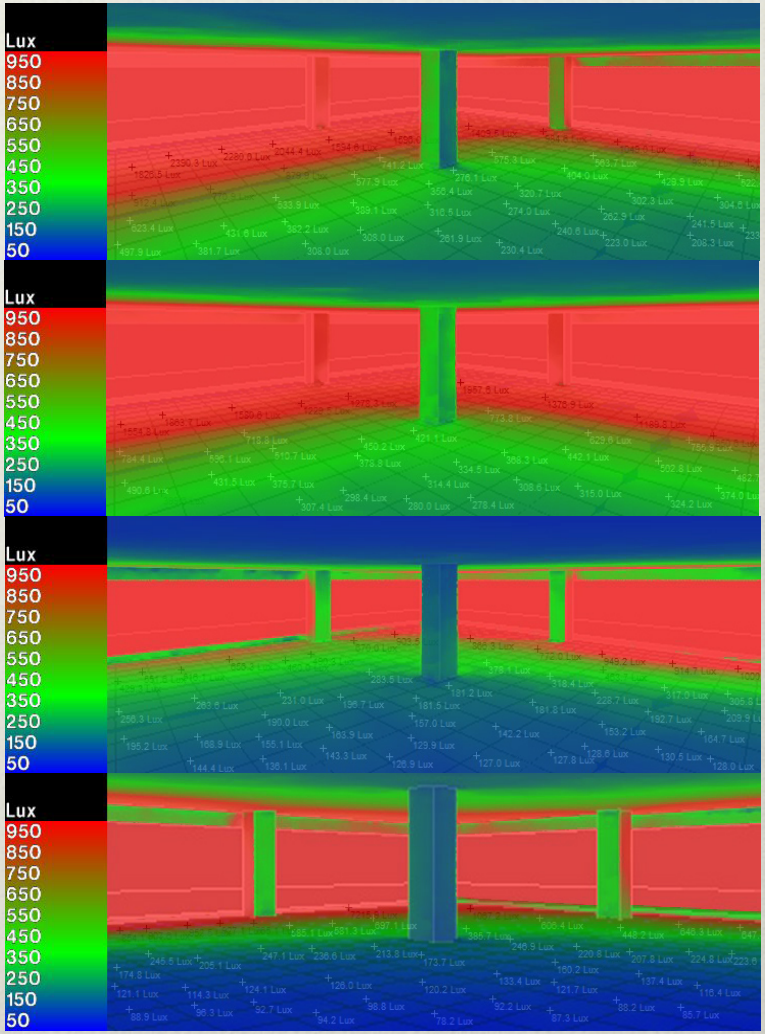
Daylight I luminance (Lux)

I luminance is a measure of how much the incident light illuminates the surface, to correlate with human brightness perception.

Objective:

Analyzing the influence of the facade on the I luminance Level considering the four ZONES from East, West, North and South from Typical Floor Plan.

Analyzing the Performance of the facade for Critical Time of the Year, when there is no Direct Solar Exposure on the façade.



SHADING ANALYSIS

Working Hypothesis:

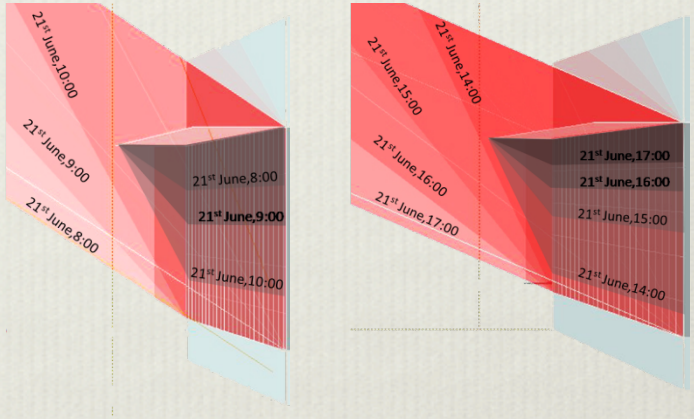
Shading refers to depicting illustrations by varying levels of darkness.
With the analysis of shading on façade the per cent of solar gain entering a building can be controlled throughout the year.

Sun-Path & Shadow Range:

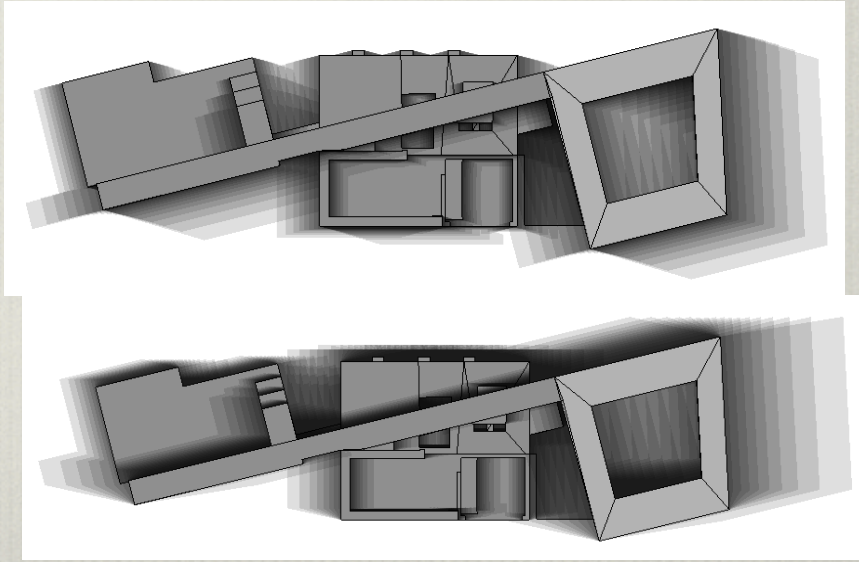
To analyze the shading on the building in all the seasons. And on the basis of the analysis ,strategically select the type of glass.

Analyzing Shading Depth:

Analyzing the required shade depth for EAST,WEST, NORTH and SOUTH FAÇADE containing shading elements.
With software simulation we generate the exact shade Depth required for the selected façade.



**** The Red Shadows show the solar traces on the façade and the Black Shadows show the shadows on the Façade.***



THERMAL ANALYSIS

Working Hypothesis:

The study is to find the good performance based system in terms of System Global U-Value (Ucw).We conduct both solar and non-solar heat gain calculations to give total heat transfer rate through glass and façade system.

Solar Heat Gain :

Refers to the increase in temperature in a space, object or structure that results from solar radiation. The amount of solar gain increases with the strength of the sunlight, and with the ability of any intervening material to transmit or resist the radiation.

Non-Solar Heat Gain:

Occurs when heat from the outside flows through the external building envelope. This occurs almost exclusively by conduction, however some convection may occur within some cavity constructions.

In a building element, instantaneous heat flow depends upon the characteristics of the materials that make up that element, as well as overall surface area and the temperature difference between inside and outside.

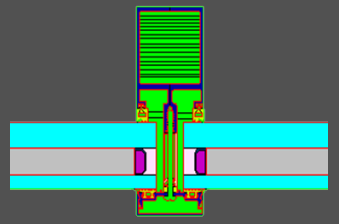
Solar Heat Gain

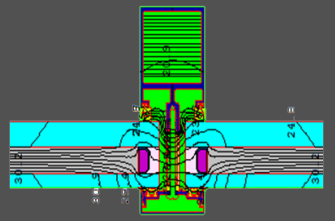
SOLAR HEAT GAIN

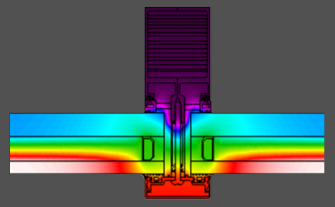
Side	Q (W/m2)	
South- West	49.42	
South- East	67.02	Max.
North- East	44.46	
North- West	42.18	Min.

Solar Heat Gain =SF x I
Where,
SF = Solar Factor , I = Solar Intensity

Non-Solar Heat Gain





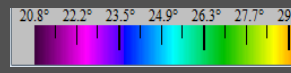


NON-SOLAR GAIN

Ucw Value

System
Mullion
Glass

Non-Solar heat gain = Ucw
Where,
Ucw = System Global U-V
A = Opening Area
ΔT = Temperature Differ



**The following images show the HEAT transfer through the syste the Thermal performance based Global U Value (Ucw).*

OTTV ANALYSIS

Working Hypothesis:

Over-all Thermal Transfer Value
Control of OTTV implies the control of heat transfer through the building envelop.

Objective:

The main objectives in introducing the OTTV controls are
To develop and implement energy efficient building design protocols and the relevant design tools -Hence promote energy conservation.
To establish energy management benchmark and develop best practices system for various building type.
To suggest ways to improve energy efficiency in buildings.
To encourage climate-responsive building planning and design.

NORTH FAÇADE OPTION-1

Azimuth Angle = 180°

Section	Aw	Uw	Tdeq	Af	Uf	Tdiff	ESR	SC	SHGC	Q
N1	1535	0.43	10.00							6686.46
N2	545	3.08	8.8							14800.46
N3				1200	1.3	5	185.06	1	0.23	58876.56
N4				1565	1.3	5	185.06	1	0.2	68096.28
N5				550	4.98	5	185.06	0.89	0.58	72729.14
Sum	2080			3315						22188.9

OTTV of this façade = 40.99

NORTH FAÇADE OPTION-2

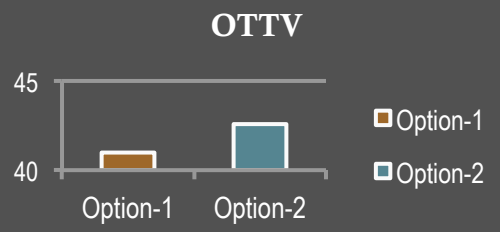
Azimuth Angle = 180°

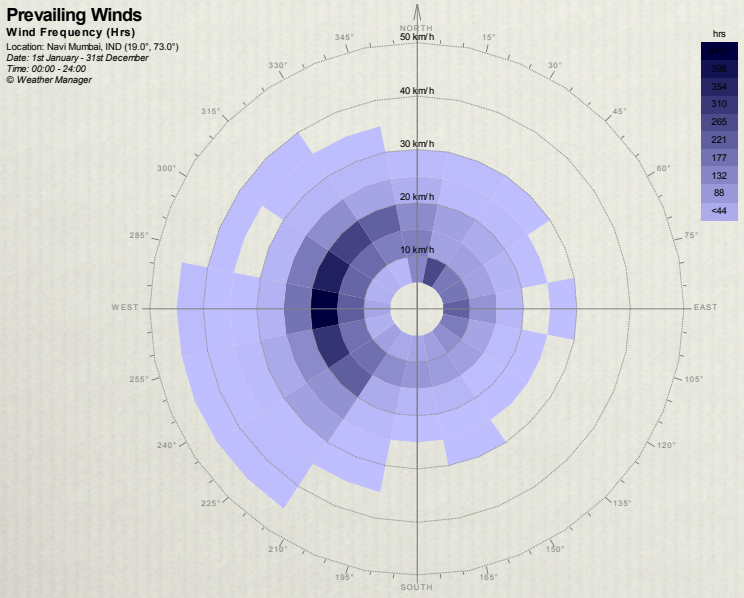
Section	Aw	Uw	Tdeq	Af	Uf	Tdiff	ESR	SC	SHGC	Q
N1	1535	0.43	10.00							6686.4
N2	545	3.08	8.8							14800.4
N3				1200	1.30	5	185.06	1	0.23	58876.5
N4				1565	1.29	5	185.06	1	0.23	76706.6
N5				550	4.98	5	185.06	0.89	0.58	72729.1
Sum	2080			3315						229799.

OTTV of this façade = 42.59

Inference:

Option-1 is preferable.
Though , the OTTV for both the Options are close to the standard value required for Glazing i.e. 50 W/m2.





WIND ANALYSIS

Working Hypothesis:

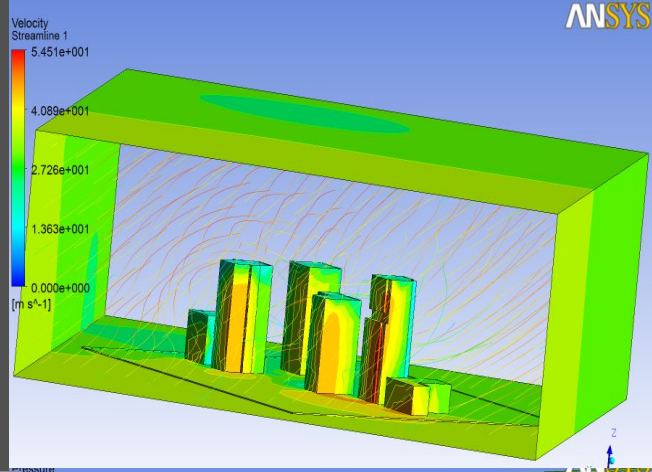
Wind Pressure estimation depends on the following measures:

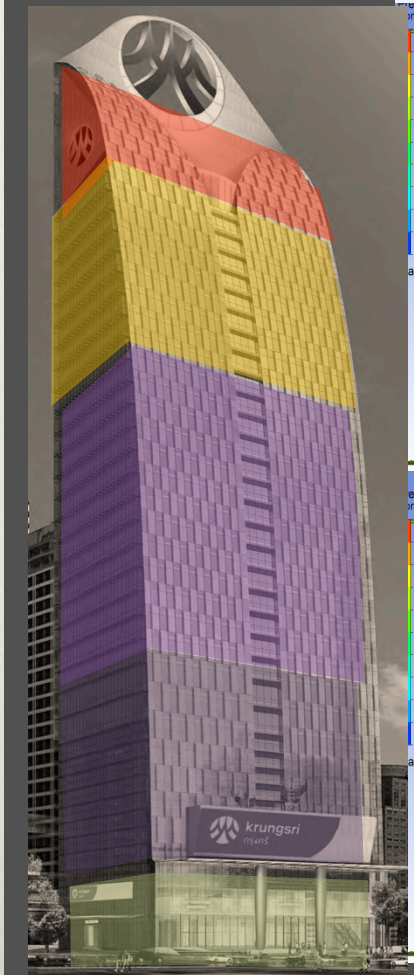
- *Building Dimensions (Length, Breadth & Height)*
- *Wind Speed as per location.*
- *Class, Category & other wind parameter.*
- *External Pressure co-efficient.*

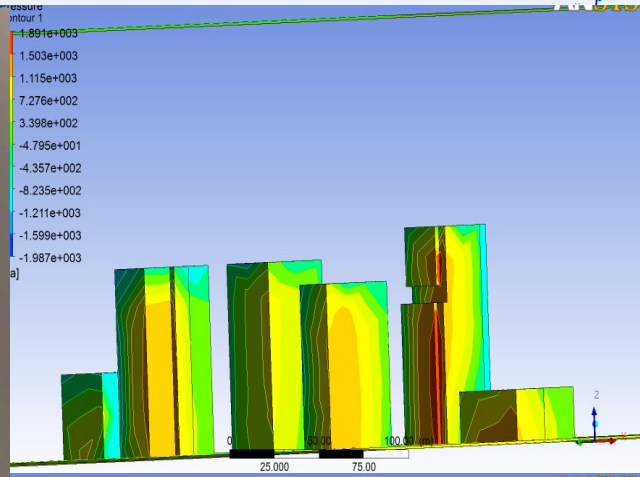
Wind Load Calculation Zoning

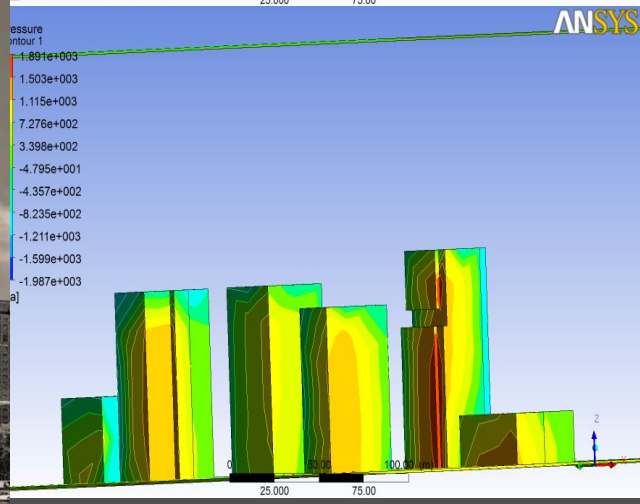
Zone – D =	2.15 KPa
Zone – C =	2.03 KPa
Zone – B =	1.84 KPa
Zone – A =	1.46 KPa
Zone - 0 =	1.02 KPa

Note: Wind Tunnel Testing will help us in determining exact wind Pressure acting on Facade.









FAÇADE LIGHTING

Objective

Professional façade lighting is a key component of the external appearance of hotels and restaurants. As an integral part of the façade it highlights special features of the architecture without Impairing them.

Classic lighting scenarios can be created with Lighting. Buildings can be turned into genuine landmarks. Unique lighting effects can create A 3D impression, give buildings their own character and make them popular attractions in the cityscape, both day and night.

FCD PROJECTS

Nathani Heights, Mumbai

Ipenama Nariman Point, Mumbai

Empire Tower, Mumbai

FCD PROJECTS

MMRDA Project, Mumbai

Orbit Terrace, Mumbai

Vashi IT Park, Mumbai

THANK YOU

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