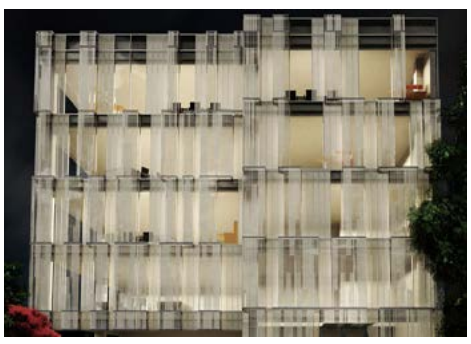
# Glass Facades in Chennai: *A Design Challenge*

Designing environmentally responsive and sustainable buildings in hot and humid climates has never been easy, especially when relying heavily on passive design strategies. This is one zone where it's nearly impossible to reduce the EUI (Energy Use Index) passively without subjecting its occupants to a (dis)comfort level much beyond the limits of even adaptive comfort zone. Chennai, as we know, is perfectly situated in this very hot and very humid tropical climate zone (13.0°N Lat.). So, when we were asked to design a commercial building with maximized views (hence, more glazing), our team took upon the project as a challenge and an opportunity to develop a design response that is a sleek glazed building with international appeal and yet is environmentally conscious.

The project, titled 'Jashn' (commercial component) is situated on a corner property on Marshalls road in the Egmore area of Chennai and comprises of approximately 30,000 sf. To our advantage, the commercial building (or rather the commercial wing of the development) was designated on a plot abutting its residential wing on the west side, thus creating an adiabatic condition on the west wall. We were left to design a building with façade exposures on the north, east and south.

**The Jewel Box:**

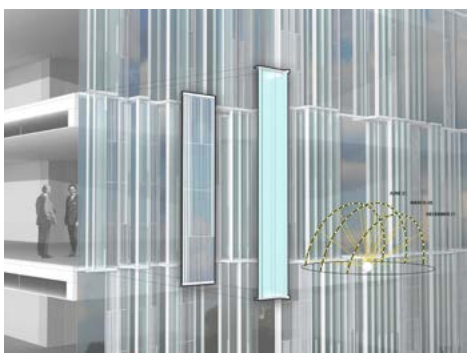
The small commercial building intends to house the core team of a prominent developer in Chennai who wanted a building that could demonstrate their own aspirations and expertise and one that they could be inherently proud of. The 'jewel box' analogy was an apt response of the design team to meet the client's goals and aspirations. The end design is a building formed to maximize the FAR and clad in layers of white transparency that delicately shroud the building during the day and allow it to glow at night.



The shroud expresses a vertical aesthetic, which is emphasized by a floor-to-floor glazing, 3 meters tall. The expression is further reinforced a varying scales from the exterior channel glass baffles to the custom vertical frit pattern to interior vertical window treatments, all together creating a richness in it's depth.

**The Performative & The Poetic:**

Understanding the significance of the façade in contributing to the performance of a building, it was our goal to merge the poetic gesture of the façade with its performative aspirations. The layers in addition to being aesthetic are also helping reduce direct solar radiation incident on the façade, thereby reducing the external loads on the building.

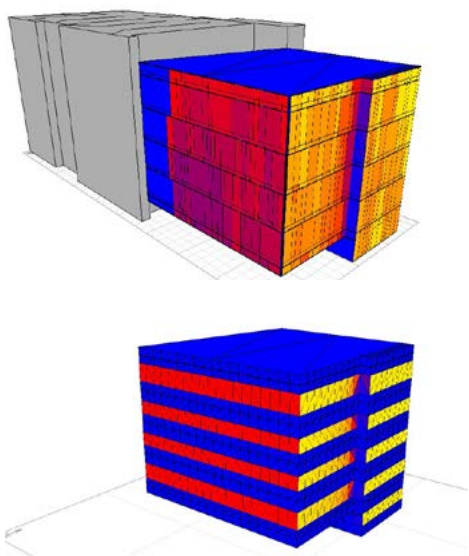


The primary façade comprises of high performance DGU with low-e coating with roughly 50% of glazing with custom frit pattern. The DGU (supplied by Saint Gobain) is composed of 8mm glazing, 12mm air gap and 6mm clear glass (interior). The DGU's properties include an SHGC value of 0.25 and the u-value of 1.6 W/m²K, which makes it one of the highest performing DGUs available in the market. The custom frit pattern is placed not only for the aesthetic effect but also in response to the exposure of the façade to direct solar radiation and balanced with the desire for external views, especially from the executive offices on upper floors. The secondary skin comprising of channel glass (also 3m tall) span floor-to-floor and act as baffle/shading panels for the primary façade. They are placed strategically in front of clear DGUs (without frit pattern) and especially those with operable panels to minimize air drafts and sound pollution. Internally, vertical translucent fabric window treatments are proposed to further deal with radiation and glare periodically and as required.

All in all, the façade has a textural richness in its layers where each layer is assisting in mitigating external heat loads and controlling daylighting and glare.

**Analyzing the Façade**

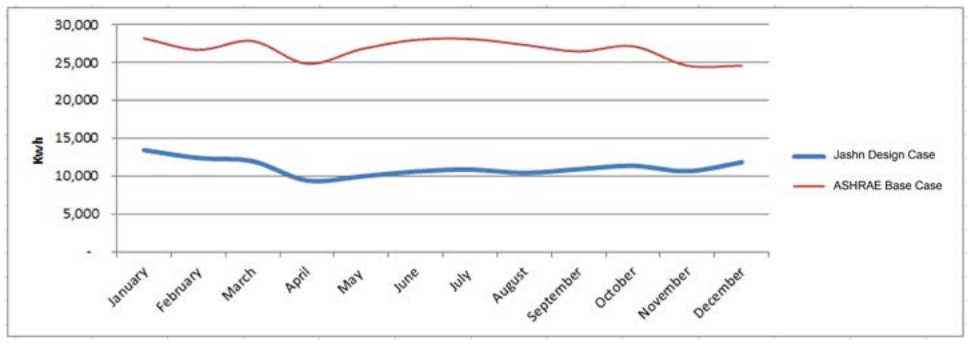
Although, full energy analysis for the building was not required, the design team none the less wanted to understand the impact of high performance façade design. With previous knowledge, and looking at the building peak load profile of typical commercial office buildings in hot and humid climate of southern India, we know that the primary heat load on the external skin is contributed by direct and indirect solar radiation. The study that our team then took on was to study solar radiation transmitted through the proposed building façade and compared it to a ASHRAE 90.1 compliant base case building envelope.



Two models were built in Ecotect, one as per the design and materials in the proposed building and the other (base case) with the exact same volume and the building envelope as per the prescriptive requirements outlined in ASHRAE 90.1 standard. It should be noted that the base case with 40% overall window wall ratio (WWR) is distributed on all four facades, whereas the proposed design has maximum glazing on the east and south facades, minimal (roughly 18% WWR) glazing and an adiabatic condition on the west wall. The two models were then simulated for total solar transmittance into the building and the results were encouraging. The proposed design case resulted in transmitted solar radiation averaging approximately 55% less than the ASHRAE compliant base case.

Although, this study does not use a full energy simulation, considering that solar radiation can amount to around 38% or building envelope loads in this climate, a significant reduction in solar gains through the envelope will certainly have a considerable impact not only in the overall energy consumption of the building, but also improve occupant comfort, especially at the perimeter of the building.

While the method of analysis used here lacks comprehensive details, it certainly demonstrates how a glazed building could be designed in a climate such as that of Chennai and still perform up to the standards set out by ASHRAE or ECBC (India), if not out-perform it. An important criterion is clearly in minimizing the overall WWR and being selective of the orientation where glazed facades are placed. In the case of 'Jashn', the existing site conditions facilitated us in completely blocking the west façade thereby allowing us to maximize glazing on the south and east façade which are the primary frontages of the building.




The building, which is currently under construction, has turned out to be a great case study for us to begin to balance the aspirations of our clients while being conscious about the environmental and energy impacts of our design.

***About the author - Varun Kohli***

***Varun founded Merge Studio in New York in 2010; a studio fundamentally grounded on principles of environmentally responsive design. He is currently heading major design projects globally incorporating a multitude of typologies including commercial, retail, multi-residential, master-planning and hospitality based projects spread out in US, India, Australia and the Caribbean. Varun has over 15 years of experience with New York based architectural firms including Beyer Blinder Belle and Skidmore, Owings & Merrill (SOM). Prior to forming Merge Studio, Varun was an Associate at Skidmore, Owings & Merrill (SOM), where he played a key role in integrating environmental analysis to the design process. Varun holds a graduate degree in Sustainable Environmental Design (with commendation) from the Architectural Association School of Architecture in London and a Bachelor of Architecture from the City College of New York. In 2010 Varun was awarded a 'Professional Achievement Award' by the Society of Indo-American Engineers and Architects based in New York.***