14 Summary of the Webinar Presentation

Ghina Yamak

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Hosted by: Spatial Analysis and Simulation Lab/Community (SASL)
Title: **The Facade Forum: Exploring the Science and Art of Building Envelopes**

Introduction

The Spatial Analysis and Simulation Lab (SASL) hosted Ghina Yamak, a principal facade consultant, in an insightful webinar on the complexities of facade engineering. Dr. Nabil Mohareb introduced the speaker and the SASL community, a research lab focused on spatial analytics, simulation, computer vision, and photogrammetry. The presentation, titled "The Facade Forum: Exploring the Science and Art of Building Envelopes," aimed to deconstruct the processes, decisions, and expertise behind the design and construction of high-performing building facades.

Speaker Profile

Ghina Yamak is a Principal Facade Consultant and Team Lead at Zuteri Engineering International. An RIBA chartered member and an affiliate of the Society of Facade Engineering, she possesses extensive experience in delivering complex and innovative architectural projects from concept to completion. In her leadership role, Ms. Yamak manages design teams, applying deep technical knowledge in materials, facade systems, and building codes to deliver inventive and sustainable solutions. Her portfolio includes high-profile developments across the Gulf region, such as leading the technical design for a large-scale, mixed-use project in Riyadh that incorporated the Najdi architectural style while targeting LEED Gold and Mostadam Communities accreditation. She has also managed the facade design for a net-zero business complex in Masdar City and performed technical peer reviews for prestigious projects in Neom. A recognized voice in her field, Ms. Yamak is a frequent speaker at key industry events like the Big Five Global Conference.

Presentation Insights: **Theoretical Framework and Research Approach**

The webinar focused on the multifaceted discipline of facade engineering, positioning it as the critical intersection of architectural vision, technical science, and urban integration.

Core Concept - The Dual Nature of Facades:

Eng. Yamak framed the building envelope as being analogous to human skin: a breathable, functional, and protective layer that separates the building's interior core from the outside environment. This "skin" serves two primary functions:

- **Technical Performance:** The facade must control heat, manage solar gain, prevent air and moisture ingress, reduce noise, and resist wind, fire, and seismic forces. Every material, joint, and detail is critical to ensuring durability, efficiency, and regulatory compliance.
- **Aesthetic Identity:** Facades are the building's identity, defining its proportions, texture, transparency, and visual character. They enable a structure to respond to its cultural context and enter into a dialogue with its urban surroundings.

Architect vs. Facade Consultant:

A key theme was the complementary but distinct roles of architects and facade consultants.

- **Architects** primarily focus on aesthetics, expression, geometry, materiality, and the building's visual interaction with its surroundings. They often produce "dreamy renders" with optimistic and challenging geometries.
- **Facade Consultants** focus on technical performance and buildability. They analyze structural stability, wind loads, thermal and acoustic performance, moisture control, code compliance, manufacturing limitations, and installation logistics. Their role is to translate the architectural vision into a high-performing, safe, and durable building envelope.

Vernacular vs. Modern Architecture in Hot Climates:

Eng. Yamak highlighted the fundamental shift from traditional to modern architecture in regions like the Gulf.

- **Vernacular buildings** were inherently sustainable and responsive to the environment, using features like thick mud walls, shaded courtyards, and small windows as passive solutions to reduce heat gain.
- **Modern architecture**, driven by urban growth and globalized aesthetics, introduced glass curtain walls and complex geometries that require extensive and careful engineering to mitigate extreme solar radiation, high temperatures, and humidity. This shift, as she described it, "created a problem" of high energy consumption that engineers must now continually work to solve.

Thematic Explorations and Mitigation Strategies

1. Sustainability, Cost, and Performance

Sustainability is no longer a trend but a core requirement, driven by green building certifications like LEED and net-zero targets. Facades are central to this effort, as they can be responsible for up to 60% of a building's energy loss and contribute about 25% of its total embodied carbon.

This performance goal is directly tied to cost. The building envelope typically accounts for 20-25% of a total project budget. Ms. Yamak emphasized the need to balance two types of cost:

- **CAPEX (Capital Expenses):** The upfront investment in design, materials, and construction.
- **OPEX (Operational Expenses):** The long-term cost of running and maintaining the facade, including energy for heating and cooling, cleaning, and repairs.
  A high-performance facade may have a higher CAPEX but can significantly reduce OPEX over the building's life, representing a critical long-term value proposition for clients.

2. Facade Risks and Failures

The presentation detailed several critical risks associated with facade design and construction:

- **Water and Moisture Ingress:** Described as the "biggest enemy," water leakage can lead to interior damage, fungus, and costly remediation.
- **Structural and Wind Load Failure:** Poor design or fixing can cause cladding panels to fall, posing a significant safety hazard.
- **Fire and Life Safety:** Improperly designed rainscreen systems or spandrel panels can allow fire to spread rapidly up a building's exterior.
- **Poor Construction Quality:** Even a perfect design can fail if manufacturing and installation are poor, resulting from issues like incorrect fixings, misaligned components, or a lack of quality control.

3. Mitigation Through Coordination and Commissioning

To prevent these failures, Ms. Yamak outlined two essential mitigation strategies:

- **Multidisciplinary Design Coordination:** Early and continuous collaboration between facade consultants, architects, structural engineers, MEP, and sustainability teams is non-negotiable. Tools like BIM are heavily used to resolve clashes and ensure alignment between disciplines.
- **Facade Commissioning and Testing:** This is the "moment of truth" where the as-built facade is physically tested to verify its performance. This process includes a range of on-site and off-site tests for water infiltration, air tightness, structural loads, acoustic performance, and fire resistance, ensuring the final product meets the design intent.

Interactive Session (Q & A)

Q1. What was the transition like from being an architect to specializing in facade engineering?

R1. Ms. Yamak credited her family's background in stainless steel manufacturing for instilling a hands-on, technical passion from a young age. Her Master's degree, which involved a design-and-build facade project, was the turning point that solidified her interest. She strongly advised students and recent graduates to explore and find a specialty within the broad field of architecture, as it adds significant value in the market.

Q2. What tools are used to design for climate change, particularly given the challenges of modern architecture in hot climates?

R2. While energy simulation and modeling software are the primary tools used in the design phase, Ms. Yamak cautioned that they have limitations. She emphasized the irreplaceable value of physical mock-ups and on-site testing, which often reveal real-world issues that simulations cannot predict. She cited her work on the Diriyah Gate project, where the challenge of integrating traditional adobe materials with modern structures required practical, hands-on problem-solving beyond what software could offer.

Q3. How can consultants justify the need for a facade subconsultant to a client when it was not included in the original budget or contract?

R3. Ms. Yamak explained that the impetus for high-performance standards (like LEED or Net Zero), which typically require specialist consultants, comes from the client and high-level stakeholders, not the design team. These requirements are driven by the client's own goals, whether they are related to sustainability, market positioning, or attracting a specific demographic. The consultant's role is to facilitate this vision and clearly communicate the associated cost implications.

Q4. This was a comment affirming that facade engineering has become a distinct and essential discipline in Saudi Arabia, integrated within comprehensive project management (PMO/PMC) frameworks that oversee the entire project lifecycle.

Key Takeaways

1. **A Hybrid Discipline:** Facade design is a convergence of architectural art and technical engineering, requiring a balance between aesthetic vision and empirical performance.
2. **Specialist Roles:** There is a critical distinction between the architect's focus on aesthetics and the facade consultant's responsibility for performance, compliance, buildability, and risk mitigation.
3. **Climate and Context:** Modern globalized designs often create environmental challenges (e.g., solar gain) in hot climates that were inherently solved by local vernacular architecture, making engineering intervention essential.

4. **Performance is Paramount:** Driven by sustainability goals, facades are central to a building's energy performance, responsible for up to 60% of its energy loss.
5. **Cost is a Lifecycle Calculation:** Decisions must balance upfront capital costs (CAPEX) with long-term operational costs (OPEX), where higher initial investment in a quality facade can yield significant savings over time.
6. **Risk Mitigation is Key:** The primary risks in facade engineering—water ingress, structural failure, and fire—can be catastrophic and must be addressed through rigorous design, quality control, and testing.
7. **Verification is Essential:** Multidisciplinary coordination and physical commissioning are the two pillars of successful facade delivery, ensuring that the designed performance is actually achieved on-site.

Conclusion

Ghina Yamak's presentation provided a comprehensive and clear overview of the critical field of facade engineering. By bridging architectural theory with the practical realities of construction, cost, and risk, she demystified the science behind creating building envelopes that are at once safe, efficient, and expressive. Her insights underscored the indispensable role of the specialist consultant in navigating the complexities of modern construction and served as an inspiring call for architectural students to pursue specialized career paths.

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