INTRODUCTION

Building facades are a very emotional subject – they represent owners’ and architects’ individualities and become a lasting monument of their earthly achievements. On the other side, facades may account for up to 25% of total construction cost and are the largest single determinant of building performance.

The goal of facade engineering is to achieve the enclosure of inhabited space by introducing tangible performance into the intangible expression. This is generally realized by employing a combination of materials and developing details that would allow architects and owners to realize their visions while making a lasting impression and not putting the physical integrity of the building in compromise.

Emerging of the façade engineering

By the end of the 20th century, high performance facades had become so complex that facade engineering gradually began to emerge as a specialized discipline (Ledbetter, 2001). Function and construction of facades are seldom fully understood by modern architects. Development of the load bearing frame in the mid-19th century began the division of specialized labor and the development of structural engineering as a separate profession. The Facade became the architect’s domain. Freeing facades from the structural burden increased the architectural freedom in shaping their form unrestrained by their function.

Tough marriage of new form and old function

Today’s market is dominated by Deconstructivism, with architects rejecting the idea of ornament as an after-thought or decoration, and with the desire to design one-off branded landmark buildings. However, this design is achieved by departing as far as possible from forms traditionally shaped in response to dominant adversary forces of the local environment and commonly recognized as optimal from a physical functionality standpoint. Also, the deconstructive freeform afforded by advances in computer technology ironically challenges the goal of prefabrication facilitated by the same advances. Consequently, the new development often gives up the quality component associated with unitization. This new development presents a higher risk of inferior performance and conversely greater challenges for designers as a result of both: the form unresponsive to elements and singular production. Following the gradual elimination of technology and science from architectural curricula (Woudhuysen and Abley, 2004) the market created a significant gap, as the scientific literacy among architects decreased, and public expectations toward building performance increased.

Progress in construction materials and systems

This inferiority comes in spite of continuing developments of construction systems, materials, stringent quality requirements, and new codes. Paradoxically, with the lack of reliable sources of information and the relatively quick development of new codes, construction systems and materials became an additional source of confusion, causing long-established methods and systems to no longer be applicable, even for traditional facades. The incongruency is demonstrated by the transformation of façade attachment technologies caused by the introduction of a thick layer of thermal insulation in response to the energy crisis of the 70’s. Three decades later, textbooks still teach these types of obsolete technologies, and the new technology is still a mystery to many. The compatibility between different membranes, adhesives, and their substrates is a good example of knowledge that is less than mainstream. Functions performed by different components of cladding systems are another surprising example.

Sources of Information

Architects may seldom admit it, but they often rely on information obtained from manufacturers and installers, not necessarily known for their impartiality, but yet relying on their understanding of building physics, codes, and constructability of products other than the ones in which they have a vested interest. This strategy (which may work miracles in a relatively small development, emphasizing availability of
products and services, as opposed to their quality), should not be transferred into large developments benefiting from the economy of scale.

Building Enclosure Market

Designers are also approached by building enclosure consultants selling consulting services in their respective fields of expertise. The peculiarity of the American, design-risk-averse market is that the consultants offer chiefly a reactive experience, which is generally less useful in architectural design, as designers typically attempt to design a new quality, as opposed to just avoiding errors of the common repetitive architecture.

Neither façade engineering education nor a benchmarking and licensing system for building enclosure professionals exist in the U.S. Either option would offer a basic protection for an architect inviting them to the design team and taking a vicarious role in responsibility for their errors and omissions.

There is a need for an organized and orderly approach to façade engineering. The first step in this process would be education, which is the goal of this presentation.

Why is construction so backward?

Throughout the case examples presented during this presentation, several major challenges will be exemplified.

Stark contrast to other industries

Looking at building enclosure as a product, many question its cost versus performance ratio. This is generally an overpriced product with abysmal performance, uncertain delivery time, number of negative externalities, and the highest toll of fatalities and injuries. The comparison to other industries: e.g. computer, automobile, or aviation makes the building construction industry blush in embarrassment and unreasonably elevates consumers’ expectations toward the quality of construction.

The comparison of education proves interesting. For example, commercial pilots train on flight simulators loaded with data retrieved from "black boxes" taken from the aircraft after collision. One can only wish a similar process to be employed in the construction industry. To the contrary, the continuing education of construction professionals is typically provided by sales representatives who typically were re-christened technical consultants in an attempt to sell constructions materials. Feedback from the end of the construction life cycle is seldom disclosed due to secretiveness of the forensic processes in which the information is obtained.

Steel cheaper than minds in one-off production

Design is the key to quality and the mass production allows for design cost amortization. Therefore, any product that is run in large quantities would get a much more thorough design and engineering review than any building would ever receive. Any obstacles to prefabrication and mass production necessarily impede the progress. (Woudhuysen and Aibley, 2004). Efficiency drives the consolidation in the design industry.

Challenges specific to façade development

Design Oversight

Architects no longer feel in full control of façade design and it alters the process in which they design. Cross-disciplinary understanding is rather poor. (Porteous, 2002). However, architectural duty to oversee the design is not a task to be delegated (Kelleher et all, 2005).

Architectural oversight of the design

An architect is expected to coordinate data obtained from many different consultants. And so, electrical fixture penetrations should be coordinated with waterproofing, mechanical air intakes placed far from sources of pollutants, etc.
There are typically multiple engineering and technological options available in the beginning. Engineers may choose options that would best accommodate other façade functions if only the building enclosure information was made available to them early in the design process.

Examples may include: a structural engineer introducing a bolted connection in a location where it would allow for constructing a continuous layer of waterproofing, accommodating thermal breaks in bridging connections, designing a soft joint in a cast-in concrete structure to accommodate a below-grade waterproofing membrane, or simply slightly relocating structural components penetrating a roof to allow minimum distances required for technological roofing installation.

**Growing division of labor - challenges in the process**

The growing number of consultants necessary for the successful performance of a building enclosure has caused the subsequent need for façade engineering coordination to bridge the gap between consultants. One observation is that an architect in charge of a large project is often overwhelmed. The first challenge to a successful project is the scientific literacy that would allow for clear, concise, and correct team communication. This type of education is currently absent from most architectural curricula (Woudhuysen and Abley, 2004). The second is the misperception of consultants’ hierarchy and subsequent gaps in communication leaving architects powerless in their attempts to clarify communication and verify progress of delegated tasks. Yet another challenge is the project management skills required for overseeing and managing a growing team of consultants. As a result, there is often a disconnect in communication and coordination among parties designing the enclosure. This scenario, however, is vastly improved if the same team proceeds to design a second building.

The natural tendency on the part of the architect is to give preference to the multi-disciplinary façade engineering firms, which provide in-house coordination among their own disciplines. However, the author witnessed how, often, the failure of this scenario may hurt the architect because the ultimate responsibility to oversee a design ultimately lies with the architect.

**Solution**

These challenges may be addressed by a further specialized division of labor, with the architect employing a dedicated façade engineering and project management staff. A façade engineer would be in the best position to educate and empower architects to coordinate and communicate with the team.

**Isolationism**

Facade engineering should ideally be comprised of all functions of the building shell, holistically.* All physical performance aspects listed should be analyzed in conjunction with each other because all these factors overlap and intertwine.

It naturally follows that it would be a bad practice to analyze any of these facets in isolation from the others. A frequent example is an unconditional endorsement of plastic spray foam insulation by building enclosure consultants unaware of basic building code requirements. As a consequence, their clients: owners and architects face hardship as the changes to the design are required by the code officials later.

**Solution**

Choosing and coordinating consultants to provide a balanced, holistic approach to the building enclosure requires a knowledge spanning numerous disciplines. Again, an informal role of a façade engineer should be to step up to educate and empower architects to improve coordination and communication within the team.

**Project delivery modes**

**Delegated Design – the missing link in the mixed delivery mode**

Another issue is the disparity of project delivery modes. More often than not, in the traditional design-bid-build projects, a delegated design team provides the final engineering of the systems that compose the façade. The challenge is that they are often selected after the bid, often making these systems subject to
substitution and generally making the delegated design team disinterested in their primary design. This creates a second gap in the design process, because it ends the discussion before the input from the delegated design team can be solicited.

**Solution**

The role of a façade engineer is to become a proxy of a design team, providing scientific information on constructability, performance, and materials with respect to miscellaneous proprietary systems that may be considered for use at the design phase.

**Construction Oversight**

As general contractors are pulled from project execution and became de-facto project administrators, the gap in the construction coordination is widened as well.

Subcontractors, skilled in their respective trades and construction materials, are left in a vacuum with respect to the interface of adjacent systems, load transfers, and sequencing. The knowledge necessary for these critical components is seldom available to the general contractors and managers; therefore, they turn to architects with their questions. These are the same questions that were left unanswered by the architects during the design process. The only exception to this void is the choice of systems and materials which have now been clarified as the delegated design teams have entered the picture.

**Solution**

A project employing a façade engineer in the design phase eliminates much of the anxiety and uncertainty of the construction phase because the gap between architectural documentation and submittals narrows significantly. Detail drawings and schedules now parallel the design, allowing for significant savings in effort required for submittal creation and review, and can allow senior staff concentration to be on higher level issues.

For an enclosure design that has not benefited from this kind of façade engineering support, the primary role of the building enclosure consultant is damage control and risk management. This model, which is popular in the US, has resulted in notable examples of building enclosure consultants actually becoming skilled negotiators in construction disputes.

**Definitions:**

Building enclosures became an interest of many different institutions and associations, who then created their own set of terms and definitions. The most frequent confusion of terms comes from the following:

**Building Envelope**

The building envelope is the mechanical description of a shell of a conditioned space. (Lstiburek, 2009) It may separate two inner spaces (e.g. mortuary cold chambers from the remainder of a hospital) or interior and exterior spaces.

**Building Enclosure**

The part of a building that physically separates the exterior environment(s) from the interior environment(s) makes up the building enclosure. (Straube and Burnett, 2005) This general definition includes separation between wet and dry environments regardless of whether the interior space is conditioned or not. Examples are: roofs, walls and their appurtenances, glazing, below-grade walls and slabs, overhanging slabs, screens, etc.

**Façade Engineering**

The art of resolving miscellaneous aspects (including structural, aesthetic, environmental, materials science, programming*, manufacturing*, procurement*, project management*, construction techniques*, building physics, fire*, smoke*, acoustic*, lighting*, mechanical*, electrical*) to achieve the enclosure of habitable space. The goal is to balance the overall objectives of appearance, quality, performance, cost, durability and schedule.
There is no consensus whether the facade engineering comprises all functions of the building shell holistically and what disciplines actually are excluded. The boundaries are blurred at the lack of further specialized division of labor.

**Building Enclosure Consultancy**

The American name for the façade engineering *without actual engineering* is the practice of Building Enclosure consulting. The consultant is typically limited to thermal (*moisture, heat, and air*) and sometimes structural aspects in a reactive mode (*during and after construction*).

**Classification of Façade Functions**

**Primary division of functionality**

The main functions of building facades can be divided into two primary categories, the first being the physical and the more dominant being the intangible.

**Intangible functionality**

A building’s height and other representative façade features traditionally serve as a symbol of power and wealth and play a role in the intangible attributes of building façade. Responsiveness to this kind of representative function without sacrificing the physical functionality is delicately controlled by the choice of the right design team.

**Tangible functionality**

All physical attributes of a façade play into the tangible functionality and must be carefully considered and accounted for. These considerations consist of constructability, economic viability, viewing ability, utility, sustainability, serviceability, safety, health, injury, property value and economic enterprise, productivity, operability, maintenance ability, ease of repair, durability, convertibility, and disposability (John Straube, 2009).

**Physical performance**

The elementary physical function is to protect the occupants against external adversary forces acting on building enclosures such as: *rain, wind, snow, hail, flood, sun, light, wind borne debris, blast, heat flow, water vapor, wildlife, aggressive airborne and waterborne chemicals, noise, vibrations, fire, smoke, theft, dirt accumulation, maintenance loads, and normal wear and tear*, as well as provide an ergonomic, economical, environmentally responsible, and program compliant enclosure.

**List of adversary forces and methods of controlling them**

Possibilities of controlling these natural and man-made forces include:

- **Wind** - controlled by continuous path of a structural resistance
- **Rain** – controlled by e.g. waterproofing, seals, and screens
- **Light**- controlled by e.g. shading and coating
- **Heat Flow** -- controlled by e.g. thermal insulation
- **Fire** – controlled by e.g. thermal resistive layers
- **Smoke**– controlled by e.g. thermal and air resistive layers
- **Below-Grade Ground and Water Pressure**- controlled by continuous path of a structural resistance
- **Water Vapor** - controlled by configuration of vapor retarding and permeable layers
- **Maintenance Loads** - controlled by means of access and continuous path of a structural resistance
- **Wildlife** – controlled by e.g. bird nets, insect barriers, baffles, etc
- **Windborne Debris**- controlled by opening protections
- Snow - controlled e.g. by sloping, parapet, and ledge configuration, heat traces, insulation, etc.
- Hail - controlled by resistive layers
- Earthquakes – controlled by e.g. ductility and movement joints
- Flood - controlled by e.g. openings
- Aggressive Airborne and Waterborne Chemicals – e.g. acid rain, controlled by a choice of exposed materials
- Dirt Accumulation – controlled e.g. by sloping configuration, hydrophilic surfaces.
- Noise and vibrations- controlled by e.g. addition of mass, damping, skewing and distancing layers
- Blast - controlled by a continuous path of a structural resistance
- Theft – controlled by e.g. organic glazing, shutters, steel plating, and openings hardware
- Normal Wear and Tear – requiring e.g. maintenance and inspection access

**Order of priority**

The list of priorities varies depending on project requirements. Typically, the structural, fire, smoke, and waterproofing requirements come first as they pertain to issues of life safety. The façade functions should be considered in conjunction with each other as they intertwine and overlap. Each façade component may control one or more adversary forces

**Environmental Protection**

**Functionality and Durability: Life Span as aspect of Sustainability**

A dysfunctional façade will seldom remain such for long. Either Mother Nature, users of the building, or both will step up to modify it, sometimes in a very short period of time. The life span of this facade is shortened, and the energy embodied in the construction materials is expended once again. A large percentage of these construction materials end up wasted. The practice of recycling and reuse in the construction field remains lower than in the mass production industries.

**Ecology – LEED scope in Building Enclosures**

SS- Sustainable Sites
EA- Energy and Atmosphere
MR – Materials and Resources
EQ – Indoor Environment

**Ergonomics**

Size and limitations of the human body vary little and often form a basis of codified safety requirements. Their recognition is a prerequisite for admittance into the architectural profession. Case examples range from unsafe glazing, low overhangs, and horizontal mullions designed at eye level, to unnecessary façade detailing far beyond reach of human view.

**Access Provisions**

A façade should be accessible for maintenance, repair, and inspection. A dedicated design analysis helps to verify the compliance in the CD phase. Examples otherwise include inaccessible courtyards and overhangs, visually unappealing façade ladders and railings designed as an after-thought, and house rig that isn’t designed to cover the entire façade and requires use of an exterior crane.

**Feasibility**

Constructability of facades requires spatial coordination, recognition of size and limitations of the human body and common construction tools along with an understanding of sequencing. Several blatant examples of design errors will be presented including roofing in collision with the AC sleeve, two halves of
a structural expansion joint which missed each other in the middle of a building, overlapping corner joint of a unitized wall, and two cases of glazing details.

**Typical Façade Control Layers**

Design and analysis of a façade requires visualization of façade control layers. These layers should remain continuous no matter what section or what scale of the building is being analyzed. It is also necessary that the components of façade systems that perform these functions are recognized and that they are confirmed capable to perform these functions for their intended life and conditions, particularly accommodating differential movement without failure.

**Secondary Structure**

Code-prescribed combinations of live and dead loads need to be safely transferred to the building structure and foundations. The typical challenges involve lack of architectural understanding of the means of support by the delegated-design systems, structural engineers caught by surprise with the architecture, as well as poor coordination among consultants and subcontractors.

**Waterproofing**

There is an adage “No self-respecting drop of water would miss the opportunity to enter a building.” Two of the most integral aspects responsible for the success of façade water management are the façade shape and the assembly details. The former aspect is architectural and creates challenges that are then solved by the latter. Meticulous performance specifications of façade systems help circumvent potential need for substitutions.

**Transitioning among systems**

Architects frequently seek assistance for the design of transitional details for façade assemblies. These particular details not only require specialized building science knowledge, but also a product knowledge beyond the average capabilities of the architect.

**Overlapping aspects of façade design**

Detailing of waterproofing may actually affect the structural integrity of the building, exemplifying the need for holistic analyses of building façades. It is this type of effect that uncoordinated systems can have that potentially endanger the health, safety, and welfare of the public and leave architectural practices vulnerable. Examples of these instances will be shown during the presentation.

**Condensation Control**

Uncontrolled condensation introduces moisture that has potential to damage sensitive interior materials. The sources of damage are traditionally divided into water vapor diffusion and air leakage, the latter being more potent than the former one. Local building climate is an important consideration that would dictate different strategies and strongly influence the type of analysis and range of solutions.

**Air Transfer Control**

Air leakage present a separate problem from condensation and heat transfer as an odor, smoke, noise, or otherwise polluted air transfer is undesirable. The typical examples include architectural plenums venting underground garages via residential, retail, and office spaces, a transfer of odors and noise among rooms abutting a common façade cavity, as well as pressure differentials developed by mechanical systems, and more recently by legislation as nicotine smokers utilize egress doors that develop a stack effect in adjacent spaces.

**Snow and Icing**

Atmospheric icing and snow accumulation can present a safety problem in cold and mixed climates. The analysis required to mediate this potential hazard is comprised of a combination of meteorological research, heating, and façade shape analysis.
Heat Transfer
The human body accepts a very narrow range of comfortable combinations of dry and wet bulb temperatures. Heat transfer of the façade, along with artificial lighting are the largest consumers of fossil fuels in the construction industry. The solution to this problem is to increase the thermal resistance of building envelope and reduce air transmission to a healthy required minimum. A frequent challenge to this solution is the ability to design details to avoid thermal bridging as well as ability to distinguish between the nominal and the actual thermal transmittances.

Shading - Balance between light and heat
The quest for natural light to be introduced deeper into the building body has led to problems of glare and thermal discomfort of users occupying the building’s perimeter. External shading should limit direct light and allow ambient light to enter into the building. Typical building practices in countries where energy prices are high may serve as an informative illustration of the good building energy practices.

Wildlife
Mother Nature tries to reclaim its turf by various means. Pioneering plants, acrobatic rodents, ubiquitous insects, and nuisance birds feel welcome on modern facades lacking traditional means of protection. Their presence is undesirable because they present health hazards, cause a build-up of unappetizing deposits, make people feel uncomfortable, and physically deteriorate the building materials. This threat can be assessed by proper design analysis, and eliminated by minor modifications to the architectural design.

Flood
Floods are historically the major destructive force, even to the point of overshadowing wind damage. The architectural design of a building should comply with the FEMA design guidelines in flood-prone areas and reflect lessons learned about building in hurricane-prone coastal areas, including:

- Elevating structures and service equipment
- Building with water insensitive materials
- Designing assemblies for easy drying

Noise Mitigation
Modern facades are typically attacked by elevated noise levels as they are often located within the vicinity of increasingly crowded transportation hubs and conduits equipped with machinery with moving parts. They are also routinely tried by improved sound amplification systems while, over time, they have lost weight, and become penetrated by an increasing number of anchors. In some cases equipped by ill-designed decorative trim whistles and knocks around in the wind. These factors together conspire to make silence one of the most exclusive components of façade performance that requires highly specialized analysis and tests. The results, if tested, are seldom fully implemented because of their prohibitive cost combined with a common perception of the low priority. Building practices in countries, where silence is an appreciated commodity may serve as an informative illustration of the good building practices to alleviate conduction of noise pollution.

Security
Facades are supposed to keep ill willed people away. Design concerns starting with elementary access control and including bullet and blast analysis, prevention of electronic surveillance and espionage, as well as privacy concerns caused by excessive curtain wall transparency in modern high-end residential construction. These needs should be addressed early on in the design process to prevent costly modifications.

Dirt Build-up
Although mainly a visual aspect of facades, the build-up of dirt often indicates areas that are subjected to either prolonged water exposure, which acts deleterious to waterproofing, or wildlife nesting. This problem
is equally preventable by a conscious design and easily referenced in numerous examples of existing construction.

**Fire and Smoke Controls**

Fire and smoke requirements delineate safety measures which we all hope to never need; however, a dismissive attitude is not recommended. These code requirements are the earliest to be considered. In turn, they are the first to come under the scrutiny of building officials and have proven to be the most constraining consideration in façade design. For example, the limited number and type of tested and approved firestops restrains creative solution. Early design analysis is strongly encouraged to identify fire rating requirements of glazed opening areas within exterior walls and roofs. Such analysis in the beginning of a project will cut the time and expense of a later redesign.

**Durability**

Façades are only as good as their weakest components, and these components should be identified in the design process for the benefit of the detailed design and commissioning. Access to components in need of frequent maintenance should not require façade disassembly. Limited warranties should not be relied upon to choose façade materials, as they typically cover only fraction of total replacement costs.

**Economic viability**

Without understanding and appreciation for performance factors, the forces of the competitive market drive the cost down, discouraging any quest for quality. The potential for efficiency lies within substitution of custom cladding with off-the-shelf, pre-engineered systems, versatile enough to fit most construction scenarios, and that have proven track records of success. Popular benchmark systems have been established to verify structural, water, thermal, air, and noise performance, but are frequently misunderstood and misused to demonstrate performance of an idealized assembly. From the designers' perspective the preferred choice should be a system offering sufficient flexibility, design friendliness and that would not require custom modifications in order to achieve the forms and functions required for a project. Curtain wall systems, which in Europe are offered off-the-shelf, include complicated façade shapes, integrated solar panels, integrated external and internal shading, integrated windows and doors, concealed security plating, noise-dampening mullions, and matching fire-rated mullions and glass are designed custom from in America for every single project. This need elevates the cost and diminishes the quality of the end product. A good example of this is the transition between curtain wall and fenestrations. They are typically custom-designed on every single project, even though the transition is typical enough that one would expect the sets to be sold at Home Depot. Unveiling the performance aspects, and demystifying advantages and disadvantages of commercially available cladding products would drive the competition in the right direction.

**Case Examples**

Numerous examples will be discussed during the presentation, per the table of contents. The space limits of this abstract prevent full description of the entire contents of the presentation.

**Sources of information:**

The author has found many architectural textbooks, industry manuals, and continuing education presentations contain obsolete, incorrect, and confusing information in the area of basic building sciences. Education on façade design and any kind of benchmarking system for architects, engineers, and building enclosure professionals is virtually nonexistent, offering little protection to the public. Misinformation and incompetence seem to prevail in this area.

**Literature**

Those, who turn to architectural textbooks for help will generally find archaic assemblies and rules of design practices observed half a century ago or copies of poor details partially reproduced from manufacturers’ catalogs.
Industry associations’ manuals and specifications are written from a reactionary point of view and act as a construction monitoring aid at best. (This author had developed a comparison of printed sources which offer façade engineering information to help the attendants in their reading choices.)

Research

Readers may get sidetracked by the abundant research published concerning assemblies and materials that have either failed in the real world, prompting their manufacturers to intensify Research and Development (RD) (?) campaigns by focusing on irrelevant aspects of their performance, or that have been chosen by academic researchers for grants. Their lecture was found to be educational but mostly misleading, as they tend to focus on a single tree without acknowledging the forest.

Manufacturers

Since deception became the target of product sales and marketing by substituting useful information with an obscure newspeak, the manufacturing industry recognized the backslash and renamed sales people technical consultants and professional advisors adding further to the confusion among consumers. They typically only offer valuable information with respect to technical aspects of the specific systems sold by that vendor. The details printed in manufacturers’ catalogs, generally, should not be relied upon. They are (with certain exceptions) almost invariably wrong.

Lectures and events

Façade engineering is most often absent from lectures offered in mainstream architectural events that offer a combination of academic papers, commercial marketing presentations, and presentations of forensic practitioners. While the forensic practitioner’s presentations are by far the most useful of the three, they typically offer a reactive experience of enclosure failures and damages as opposed to design and engineering of new construction. There is, however, a minority offering of façade engineering lectures, seminars, and workshops.

BEC

Building Enclosure Councils are the first step in the direction of educating the general public about the science and risk involved in building enclosures. They bring together both specialists and laymen who have a vested interest in building enclosures, offering the first entirely dedicated entity for sharing experiences and distributing knowledge of this specialty.

Other professional associations

Publications of engineering associations such as ASHRAE and ASCE were found, comparatively, to be the most useful source of information after chosen façade engineering books.

How to choose your team

After observing the façade engineering scene in both Europe and the United States, a classification of typical consultant roles was developed and a set of rules for their best utilization implemented. In general, the facades require the following analysis: cost, building physics, material science, construction techniques, code compliance, and external impact.

Challenges

Further specialization within the group

Building enclosure consulting attracts individuals from all walks of life: civil engineers, architects, former contractors, material scientists, and people of unrelated experience and education. They tend to address isolated areas within their respective areas of expertise at the expense of all other considerations. For example, it would be unwise to rely on structural engineers to address waterproofing or hydrothermal aspects of facades.
Charlatanism
With the lack of formal division of specializations there is often lack of respect for the bigger picture while the building enclosure consultants tend to market themselves as a jack of all trades. While unintentional, it may be personified like an undereducated “building inspector” with a thermal camera that, unaware of elementary building physics, mechanical principles, and building codes, draws absurd theories on the basis of thermal imagery he has produced.

Traditional classification - irrelevant
The traditional division of architecture is based on programmatic criteria: e.g. industrial, transportation, cultural, educational, retail, residential, administrative. Function of a building, as it applies to façade engineering, is mostly irrelevant as facades remain the same with few changes in performance. e.g. museums comprising mostly opaque, well insulated assemblies, and airports with sound mitigated glazing.

Solutions -Identification of key components of experience

Phase
The classification of experience begins with identification of the phase of the building life in which a certain individual was involved: whether it was architectural design, delegated design, submittal verification, production, research and development, installation, construction monitoring, failure investigations, damage investigation, or safety inspections.

Materials, tasks, climate, etc.
Building phase classification combined with information regarding the specific type of materials and assemblies and the exact nature of tasks the individual was involved with allows for recognition of their contribution to the project. Climate experience consideration is helpful for relevant fields of involvement, as well as for special considerations such as blast, seismic, or hurricane experience.

Experience Matrix
The best tool for analysis of your prospective design partner is an experience summary matrix (presented in the slide show) combined with an inquiry. The experience matrix allows you to identify the types of systems, climates, buildings, their aspects, and stages; the questioning allows you to verify the depth of knowledge.

CAD adaptability
With the growing popularity of BIM software, another issue is the integration of computer modeling from the domain of CAD drafters back into the world of mainstream design. The modern, freeform-shaped buildings require parametric software that requires a continual learning process and may require all subs to be fluent in the specific software used by the architect of record, as is the case when working with e.g. Gehry Partners. However, some consulting firms are staffed with experienced low-rise designers that left the design field precisely as a result of the poor adaptability to changes in the professional environment, and were subsequently forced out of business by the CAD software efficiency. Some within this group may not even have computer skills considered elementary in today’s work environment, such as a common office suite. A potential client may need to verify their partner’s proficiency not just in the parametric software, but also in the basic office applications to assure they are able to access the paperless file transfer portal or FTP project site.

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I would like to thank my reviewer Mr. Stephane Hoffman, the Vice President of Morrison Hershfield Corporation.

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