Simple Math : Envelope Economics and the FAR Game

Within the domain of global real estate development, the building envelope is the locus of greatest potential value creation and possible value destruction. The FAR Game is played out throughout the world and most acutely in large metropolitan city centers that politically, economically and physically support high density planning, investment, development, construction and property management. The global development industry comprised of officials, owners, investors, lenders, insurers, users, developers, managers, planners, architects, engineers, consultants, contractors, fabricators and manufacturers is, in theory, optimized to deliver maximal value and minimal risk. That the results often fall short is what allows for the increasingly competitive dance of global team building to consistently achieve best quality for best return for least risk, and ideally with the greatest enhancement to cultural, social and environmental well-being.

The global construction industry confronts the systemically inefficient building envelope design and delivery industry with equal parts frustration and necessary resolve. Every day, on every urban project, worldwide. The envelope's successful design and implementation is of such consequence to most development projects that strategic planning in this regard is critical.

The development pro-forma is the essential strategic planning tool, manifest as a mundane database worksheet, is the simplest and most fundamental document expressing any given project in multiple dimensions. Data expresses parameters in idealized terms capturing territory, space, function, quality, experience, time, cost, revenue, risk and reward. Development pro-forma manifest themselves in diverse fashion ranging from rules of thumb captured on a napkin sketch, to exquisitely crafted financial models that are simultaneously creative, precise and works of art in their own right. Poorly considered pro-forma yield sub-optimal projects. The best are enlightened meta-representations of the project in its entirety and full complexity, serving as a guiding light to an exquisite architectural and financial result.

The pro-forma, whether originated by private or institutional entity, models the project by defining land and building acquisition costs, construction costs, soft costs, financing costs and all manner of revenue and rate of return projections tailored to the risk profile and structural nature of the client and their overall ownership, development and financing model.

The FAR Game is a short-hand expression capturing, integrating and synthesizing the variables above. In the worst case it yields the banal proliferation of built form born of bottom line thinking that does not recognize the added value of design and related intangibles that deliver greater profit and intrinsic value through iconicity, brand enhancement or pure architectural quality and experience. Intense competition and increasingly sophisticated consumers of real estate world-wide have without doubt created a market that recognizes differentiated and enhanced investment in architectural aesthetics, function, quality and experience. Some buildings are clearly designed to look and perform better and are simply more desirable from an existential standpoint delivering delight, pleasure, security and comfort.

The collection of case studies presented here in the FAR Game Exhibition for the Korea Pavilion at the Venice Biennale, all aspire through creative design and ingenuity to maximize all qualitative and quantitative aspects of their individual architectural designs. The diversity of experimentation in formal

and material qualities is breath-taking and made only possible within the highly pressurized constraints of an urban environment afforded by metropolitan Seoul, and other similar dense, vibrant global cities.

The envelope itself, our specialization at Front Inc., can be reduced to simple truths expressed in simple formulas yielding simple metrics.

1. Building Envelope Developed Surface Area Divided by Built Floor Area Yielding Envelope to Floor Area Ratio

2. Building Envelope Developed Surface Area Divided by Building Volume Yielding Envelope to Volume Ratio

3. Building Envelope Developed Surface Area Subdivided into Differentiated Systems, Assigned a Cost per Area Unit and Blended into an Average Cost per Unit Multiplied by the Total Envelope Area. This Yields Total Cost of the Envelope and the Blended Rate per Unit Area of the Envelope

4. Envelope Total Construction Cost Divided by Total Construction Cost Expressed as a Percentage

5. Envelope Total Construction Cost Divided by Total Development Cost (includes Land, Consultants, Brokers, Finance Costs, etc.) Expressed as a Percentage

For those of us in practice working on extensive numbers of projects in different markets, we very quickly can understand the indexical significance of these metrics when planning a project.

While the most efficient form relative to volume is a sphere, it may not be the most cost effective in general terms, so we consider a cube as next in line for efficiency of constructional logic. For the sake of argument take a building 40m on both sides and 40m high, a perfect cube and we will ignore any sub-grade works. We assume the building is occupied fully with floor plates of nominal 4m height, so we have a 10-storey building. The envelope, including the roof, is 8,000 sqm and the floor area is 16,000 sqm, yielding an Envelope to Floor Area Ratio of 0.5. This value of 0.5 is generally and universally accepted as an efficient normative baseline for a building configuration that has an economically sensible starting point.

Using reference projects that Front has worked on, we can make some quick comparisons to this baseline:

The Seattle Central Library by OMA and LMN Architects has ~ 34,000 sqm of floor area with ~20,000 sqm of building envelope, including roof, yielding a ratio of 0.60. This area total is manifest as a myriad of envelope systems including flat conventional roofing, a small typical skylight, concrete walls and a vertical curtain wall at the podium, and the iconic feature glass wall expressed both as long span walls, short span vertical walls, all with a predominantly uniform system and geometry. The curtain wall system also benefits from piggy-backing on the primary lateral steel bracing system for the structure yielding cost efficiencies in the overall design. The overall building enclosure cost is 24 million USD with a blended rate of ~ 1200 USD per sqm, relative to a total construction cost of 110 million, for a percentage of construction cost of ~22%, and relative to a total development cost of 168 million, for a percentage of total development cost of ~14.3%. The Seattle Library underwent exhaustive value optimization during the design process to achieve these overall metrics and to deliver a spectacular, iconic, high performance building. In the context of this project and its overall budget, the values of the

metrics expressed above were deemed in accordance with the overall development pro-forma for the project, otherwise it would be simply have been built as a different variation of the project design intentions.

The Glass Pavilion at the Toledo Museum of Art by SANAA and Kendall Heaton Associates is approximately the same plan area as the Seattle Library, but is only one storey tall. The above grade floor area is ~3,800 sqm with a building envelope area of ~5,000 sqm of which 2/3rds is roof, yielding a building envelope to floor area ratio of ~1.30, vastly different from the 0.50 baseline norm. Understanding that this economically punishing metric is intrinsic to the overall formal conceptualization of the project, and with the project having a relatively modest budget, it is a given that the roof must be conventional and cost efficient relative to the overall project development pro-forma. The blended average of the total building envelope, between glass walls, glass courtyards and roofing, yields a total percentage of construction cost of 25%, a defensible number.

In the New York City context Front Inc is working on several high density 300m tall residential buildings. Both tower projects remain confidential so we will refer to them as Towers “A” and “B”. Tower “A” has a building envelope to floor area ratio of 0.9 while Tower “B” has a ratio of 1.3. Tower “A” has a complex surface geometry while Tower “B” has a Cartesian geometry. Tower “A”’s development site may speculatively yield resale value of $30,000 per sqm while Tower “B”s development site may yield resale value of $40,000 per sqm. It is clear from the outset that Tower “A” has more challenging economics in that to achieve the complex geometry of the building envelope within its specific development pro-forma will be difficult because the façade is more expensive and bears greater project risk while the maximum resale value puts downward pressure on the total allowable construction costs. In normative terms the building envelope ratio is quite high. Tower “B” has greater economic upside and has a better chance of succeeding due to its Cartesian geometry and inherent lower building envelope cost, but because of its greater building envelope ratio, key design decisions need to be made to ensure that a large portion of the envelope is conceptually simple and lower cost to deliver. While the two projects remain confidential, they are equally iconic, Tower “B”’s economics work with the building envelope at 25% of construction cost. For Tower “A” the formula is still in development relative to the pro-forma, and therein lies the truth – the design conceptualization and envelope ratios, systems and alignments must be reconciled with overall project parameters. This assumes both projects have a proportional burden in regards to land acquisition costs and general soft costs associated with development in the same market.

Front Inc has worked on over 500 projects, has completed over 150 projects and has another 100 in design and construction. Reviewing our past and current work, it is worth observing that building configurations vary to such an extent depending on circumstances and the specifics of any given design, that the metrics mentioned herein also vary significantly. Envelope Area to Floor Area has a range from 0.25 through 3.0, with a typical suburban North American commercial office building being 0.50, while the Envelope Total Cost relative to Construction Total Cost ranges from 8% through 50%. Such ratios and percentages are therefore only meaningful in the context of historical precedents and the specifics of workable development pro-forma that have been back-checked, gut-checked and fact-checked against the realities of the project, the design and its economic fundamentals.

While the formal investigations of the projects considered in the Korea Pavilion at the 2016 Venice Biennale are symptomatic in positive manner of the site and zoning constraints in Seoul, one must also evaluate whether they are also investing equally in high quality materials, systems and performance or

whether these characteristics are being compromised in some manner relative to the obvious complexity in massing and the design and construction cost overhead associated with this.

Front Inc. has been engaged with a diverse array of projects in Korea now for several years, all very interesting and challenging, a few that speak to the concerns of the FAR Game, in particular Shinsegae, Kukje and Chanel. For context we provide below a summary of our limited but meaningful contribution to date:

Shinsegae International, Gangnam, Seoul with Olson Kundig Architects – Built
Kukje Gallery, Kukje, with SO-IL Architects – Built
Asian Cultural Center, Kwangju, with Kyu Sung Woo Architects – Built
Innisfree and Teastone Pavilions, Jeju Island, with Minsuk Cho / Mass Studies – Built
Chanel Gangnam, Seoul Building with Peter Marino Architect – In Progress
Yongsan International Business District R6 Building with RE X – Unbuilt
WBC Solomon Tower, Busan with Asymptote – Unbuilt
Hanwha Research and Development Building with BIG – Unbuilt
Hyundai Tower with BCHO Architects – Unbuilt

Shinsegae International Headquarters, designed by Architects Olson Kundig from Seattle, and recently completed in the Gangnam area of Seoul, represents a different approach from either conventional curtain wall clad mid-rise corporate towers or the complex formal expressions common smaller residential and commercial projects in the region. The building brings together Shinsegae International's 500 employees in a state-of-the-art facility that houses offices, meeting areas, design studios, a rooftop garden with sculpture park, a restaurant and covered public plaza.

The building design adopts a pure Cartesian geometry, in plan, section and volume. The building supports 16,000 sqm of floor area built on a lot of approximately 1,100 sqm yielding an FAR of just under 15. The building envelope developed surface area, including façade, green roof, garden parapet and soffits is close to 11,000 sqm yielding a building envelope ratio of 0.68, that in general terms would be considered economically prudent and advantageous. This modest ratio allows greater investment in the quality and design of the envelope systems themselves in lieu of paying for a greater extent of lower quality envelope - or even paying for a similar area of more geometrically complex envelope.

Olson Kundig's design then develops an exquisite overlay of unique, expressive, well-crafted and high performance building envelope systems. The play of scale, hierarchy and proportion in the building façade elements yields a sensuous fabric-like effect and speaks to the values and the business of the client Shinsegae International, among Korea's pre-eminent fashion importers and retailers. The building envelope incorporates a host of delightful systems such as kinetic screens with expressed manually controlled mechanisms, double-height gathering and exhibition spaces, transparent and screened garden walls at the roof-top, a delicately detailed, filigree, high performance curtain wall, and retail facades animating a public plaza at street level. Olson Kundig's design knowingly invests in specific building envelope priorities yielding a calm, elegant and iconic building confidently expressing the company values of Shinsegae, achieved within and against the constraints of the FAR Game.

The new Kukje Gallery K3 building by Brooklyn based Architects SO-IL, Florian Idenburg and Jing Liu along with local collaborator Jong-Ga Architects, is located in the Jongno district in northern Seoul, a center of historic significance in the metropolitan area. The new gallery pavilion is constructed in the

middle of a tightly fit, dense but low-rise neighborhood comprised of residential, cultural and commercial buildings.

The building design and form is born very much of its function and site constraints. As an additional gallery extending its existing inventory of gallery spaces, the Kukje Gallery requested a specific proportion of gallery in order to augment its curatorial range. Idenburg and Liu researched the permissible zoning envelope and experimented with the placement in plan and section of a Cartesian volume that met the curatorial brief. This exercise yielded a precise gallery volume 16m long x 9m wide x 6m tall resolved with opaque architectural concrete facades and a perimeter skylight surrounding a floating ceiling plane. To maintain the purity of the interior gallery space all of the associated functions were designed as smaller volumes and elements attached to the exterior of the Cartesian pavilion. The zoning envelope limited what could be built above grade so to accommodate the Kukje Gallery's need for additional facilities the majority of new space is built under the gallery and in fact beyond the above-grade footprint into the adjacent parking and garden areas. These subgrade functions include a 60-seat auditorium, additional gallery and meeting spaces, art storage facilities as well as utilities and restrooms.

As described to me by Florian Idenburg, the building envelope expressed as a soft tensioned stainless steel chain-mail façade originated with contextual concerns both in regards to scale, geometry and material of the concrete gallery volume relative to the adjacent residential buildings. The Architects explored the idea of an ethereal, reflective and porous façade that would evolve its form by exploring the limits of the permissible zoning envelope while tensioning itself around and back to the edges of the Cartesian concrete volume and its associated eccentric service volumes. This tensioned mesh façade counterpoint to its host volumes would define the Architecture. An exhaustive explorative of materials and techniques would follow settling on a unique and custom stainless steel chain-mail façade to be eventually pre-fabricated under Front's direction in Anhui province, China. Extensive form-finding and engineering analysis would follow with Front's development of custom tools and analytical techniques. The team engaged in global sourcing and the eventual prototyping and development of full scale mock-ups leading to the final pre-fabrication of the chain-mail façade panels that were delivered to Korea and installed in collaboration with local Korean contractors. The project, starting in modest fashion as a one-gallery pavilion, has received world-wide critical claim with elements of its design being incorporated into the permanent collection of New York's Museum of Modern Art. The Kukje Gallery K3 is one of Front's favorite and most proud collaborative achievements and has contributed to the deserved international acclaim of Idenburg and Liu's practice SO-IL.

Front's experience in Korea working with Korean clients, local and foreign Architects has delivered to us an understanding of the FAR Game in the local context that we reference against the similar yet different context playing out in other similarly dense metropolitan regions. We are also working with Korean designers now acting on the international stage, in New York and elsewhere. The variables that play into development around the world are universal - but land value, zoning constraints, FAR ratios, constructions costs, schedule risks, real estate values and consumer sophistication are all highly attenuated in competitive global metropolitan centers such as Seoul, New York, Hong Kong, Mumbai, Singapore, London and a litany of others centers throughout the world. Architecture that contributes culturally and that enhances the built environment can only emerge in the hands of creative Development, Design and Construction teams that are fully immersed in local constraints and opportunities while delivering on what must be an ambitious design agenda that embodies the progressive values of all stakeholders in the chaotic yet beautiful process of city building.

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