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Engineering Without Engines

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Bjarke Ingels started Bjarke Ingels Group (BIG) in 2005 after co-founding PLOT Architects in 2001 and working at OMA in Rotterdam. Through a series of award-winning design projects and buildings, Ingels has developed a reputation for designing buildings that are as programmatically and technically innovative as they are cost and resource conscious. Ingels has received numerous awards and honors, including the Danish Crown Prince's Culture Prize in 2011, the Golden Lion at the Venice Biennale in 2004, and the ULI Award for Excellence in 2009. In 2011, the Wall Street Journal awarded Ingels the Architectural Innovator of the Year Award. In 2012, the American Institute of Architects granted the 8 House its Honor Award, calling it "a complex and exemplary project of a new typology."

Abstract

With the rise of technological solutions, the practice of architecture is often divorced from the cultural, social, and environmental contexts where we build. Buildings have become closed systems, connected to life-support machinery that compensates for the design principles we have forgotten over time. This is particularly true of tall buildings, especially since the rise of the International Style in the middle of the 20th Century. We have much to "re-learn" from vernacular architecture in the regions where we work, but we must also put our latest technological advances to work in realizing these principles. This paper articulates a vision for a world in which tall buildings can be "engineered without engines." It is a call for architects to return to a more central, yet more collaborative role with engineers, rather than let the content of their buildings be driven by engineering standards' conflict with arbitrary shapes.

Keywords: Architecture, Design Process, Form, Climate, Context, Integrated Design

Architecture is the art and science of accommodating the lives we want to live. It sets the stage for our lives. It is the craft of designing and building the world that we want to inhabit. Our cities and buildings aren't givens – they are the way they are because that is as far as we have gotten to date. They are the best efforts of our ancestors and fellow planetizens, and if they have shortcomings, it is up to us to continue that effort. We must pick up where they left off and create the world we want to see for ourselves and our children.

Architecture is much more than designing pretty facades or expressive sculptures. It is the craft of designing and building man-made ecosystems, through which we channel not only the flow of people, but also the flow of resources through our cities and buildings.

We are never starting from scratch. We have a planet to begin with – with climates and landscapes, biomass and minerals. From those conditions we add and subtract, adapt and evolve, modify and manipulate matter to achieve conditions even more conducive to human life.

What are the forces that shape the world around us? What are the bits of information that inform our design decisions? How can we use constraints – as design criteria – and in a Zen-like way – turn the resistance we meet into the driving force of our design? Architecture – like storytelling – strives through conflict. The greater the obstacle, the more engaging the design that overcomes it. So what conditions can inform our work?

Figure 1. The proposed Signature Tower in Kuala Lumpur challenges the universal ideas of the skyscraper (Source: BIG)

First, there's our climate and our landscape.

Bernard Rudolfsky's show at the MoMA "Architecture without Architects – An Introduction to Non-Pedigreed Architecture" highlighted the fact – mostly from an aesthetic point of view – that with the rise of the International Style of Modernism, buildings had started to look the same everywhere. The name "International Style" obviously suggests this, but the implications are troubling, and they extend beyond aesthetics.

Let us take a moment to discuss the origins of this and its perversions. Mies van der Rohe made some amazing typological innovations. He stripped the Manhattan high-rise down to its bare bones. He was good at distilling an idea into its pure essence. He said, "If it's about the view, why don't we make the entire wall the view? If it's about a big, open, inviting lobby, why don't we just make it completely empty and transparent?" So he was taking ideas to the essential extreme.

Traveling around North America, one realizes that van der Rohe did the same high-rise 10 or 20 times. He was so obsessed with perfection that he got stuck with what he believed to be the perfect solution, and then he simply repeated it.

Herein lies the problem of van der Rohe's idea of a universal application of the ideal solution. One misses the problems and potentials of the fact that there are different contexts, different cultures, economies, climates, landscapes and programs. Each parameter changes the equation and distorts the solution away from the universal, perfect solution towards the set of locally optimized solutions. We need to be much more interested in exploring the potential of these differences, rather than always repeating a certain universal ideal (see Figure 1).

The homogenized International Style neglected the usual environmental design responses. Adaptations to local environmental conditions developed over centuries were being replaced by giant mechanical systems. Essentially the buildings were now on life support – supplemented by air conditioning, central heating, and mechanical ventilation. Machines replaced the thicknesses of walls, solar orientation of the buildings, proximity to windows, the operability of windows. Electric lights even made us independent of daylight.

Figure 2. West 57, one of the projects for which the Bjarke Ingels Group was commissioned to design the interiors and exterior (Source: Wade Zimmerman)

Suddenly a building was not "performing" anymore; it was reduced to a mere container of space – a big blank box, tube-fed by a whole arsenal of machines. Building services are essentially a mechanical compensation for the fact that a building is bad at what it is designed for – human inhabitation.

One of the things that has inspired us is looking at the role that architects can play in this conditioning. Rather than simply outsourcing it to engineers or product manufacturers, we should investigate if architectural design can once again play a real active role in the environmental performance of the building.

That kind of thinking is often missing, particularly in tall-building design. The term "perfume-bottle architecture" comes from the fact that for some architects, it seems like the shape of the building and and the content of the building are two entirely separate ideas. In North America, this is exacerbated by the way the profession is organized, in that one architect may design the structure and the envelope of the building, and another architect does the interiors. Whereas in Europe, the distinction between the inside and the outside design is not common. We've been fortunate that in Vancouver, Miami and New York, we were commissioned to design the interiors as well as the exteriors (see Figure 2).

There is a whole series of architectural styles that are neither academic, nor aesthetic, but rather are purely empirical, refined through years of trial and error.

Mediterranean Greek villages, with all of their surfaces coated in white to reflect heat – and flat roofs to ascend for the enjoyment of cool evening breezes…

Igloos, designed using the high insulating properties of packed snow to create a minimum surface area of thermal exposure within a maximum contained volume…

Chinese courtyard buildings in flatlands, where one descends down into the courtyards to find calm from the turbulent winds above…

In Yemen, a field of thin chimneys rises above the city with steep-cut slopes, capped with large flat wind funnels, all facing the prevailing winds, so as naturally ventilate the six-story buildings below without any moving parts. These examples show us ways to achieve an ultimate symbiosis between architecture and its surroundings.

Figure 3. Rendering of West 57 (Source: BIG & Glessner)

Figure 4. Rendering of West 57 (Source: BIG & Glessner)

Figure 5. Shenzhen International Energy Mansion in Shenzhen, China (Source: BIG & Glessner)

Figure 6. Shenzhen International Energy Mansion in Shenzhen, China (Source: BIG & Glessner)

Clearly, we are not proposing that we return to old vernacular styles, but rather that we use all of the new machinery and computer information models that allow us to simulate and calculate the performance of the building before it is built. This includes everything from the thermal exposure of certain volumes, to the impact of air flow through structures. These tools allow us to shift the ultimate performance of a building away from the mechanical room and back into the permanent attributes of the design.

There is also much to be lauded in the increasing embrace of sustainability and environmentally sensitive technologies. But it is telling that some of the most progressive developers, who just a few years ago would have pursued the highest LEED ratings, have in their new projects asked their architects to eschew LEED certification and pursue something beyond that.

LEED certification was highly relevant for putting environmental performance on the agenda by making it visible, measurable and tangible. For example,

Figure 7. The Vancouver House in Vancouver, Canada (Source: BIG & Glessner)

the Durst Organization, our client on the West57 project (see Figures 3 & 4), strongly believes in those values. They are probably the most environmentally concerned clients that we've ever worked for. But it was becoming an unnecessary bureaucratic expense to go through LEED certification. They were much more concerned about the energy performance and the life expectancy of their building than counting LEED points. That concern poses a total design question; it is a question of integration and holistic thinking, not accumulation of "features" or "technologies."

So instead of "Architecture without Architects," what we are interested in is "Engineering without Engines" – the idea that you can make buildings that are less dependent on machinery.

The more sophisticated technology we deploy in the design process, the less dependent our designs will be on corrective technology in their afterlives. To us, this means that buildings are not just informed by the culture of a place, but also by the climate in which they are built. I'll give a few examples from our recent work.

Any building scale or type has a set of conventions and a set of attributes that are, of course, interesting to learn. Quite often, there is a good reason why certain things ended up the way they are. And sometimes certain restrictions or habits are actually leftovers from conditions of the past that are no longer current and therefore lend themselves to being questioned once again.

We are currently involved in a handful of projects in different contexts that somehow try to attack the traditional high-rise from different, specific, and importantly, localized angles. Two examples that are both very much children of their context: towers we are designing in Vancouver and in Shenzhen (see Figures 5, 6 & 7).

Superficially, these two skyscrapers share the same typological starting point: a skinny tower on a podium. But these are two very different climates. Vancouver is very Scandinavian, whereas Shenzhen is humid and tropical. For the project in Shenzhen, we have a very highly restricted envelope, but the façade is designed to maximize the exposure to the cool daylight from the north and to minimize and block off the exposure to the warm sunlight and glare from the south. So the façade is kind of like a dress; a fabric that ripples and is closed towards the south and open towards the north. This very simple idea reduces the thermal exposure and need for air conditioning by 30 percent. Without any technology or moving parts, the pure design of the façade – what makes the building look different – actually makes the building perform differently.

Meanwhile, the tower in Vancouver is wedged between the approaches of the Granville Bridge, one of the main gateways to the city. Here, because the minimum requirement is having a 100-foot (30-meter) distance from any residence and highway, our footprint is restricted. But as soon as we get 30 meters up in the air, we have already achieved the minimum distance, and the apartments can come back out to create a floor plate that is actually two times larger at the top than at the bottom, almost like pulling a curtain aside.

Architecture is obviously influenced by countless aspects beyond climate and geography: program, function, bureaucracy, economy, technology, unions, politics, materials, culture, preservation, public opinion, logistics, etc.

But no matter where you build, two aspects will always be inescapable: the environmental and the social. Architecture is always, at its core, an effort to make the existing environmental conditions more hospitable to human life.

The below is an extract of an interview CTBUH conducted with Bjarke Ingels, published in the CTBUH Journal:

What do you want to bring to tall building design?

I think any building scale or type has a set of conventions and a set of attributes that are, of course, interesting to get to know. Quite often there is a good reason why certain things ended up the way they are. And sometimes certain restrictions or habits are actually leftovers from conditions of the past that are no longer current, and therefore lend themselves to being questioned once again. I think right now we are involved in a handful of projects in different contexts that somehow try to attack the traditional high-rise from different, specific angles.

Figure 8. Seattle Central Library (Source: Steven Pavlov)

Some people might find tall building conventions to be restrictive or boring. How are you addressing those conventions in your designs?

You need rules if you're interested in bending or even breaking the rules. The good thing about conventions is that they represent a series of assumptions that you can then question. Most of the time the assumptions turn out to be valid, but sometimes either something has changed or there's a new technology, it's a different market, or the context is different or the climate is different. And then one of the assumptions is no longer valid and there is an opening to try to do something in a smarter way.

Do you spend much time looking at other tall buildings?

Yeah, I think we always spend a lot of energy looking at what's already there. Like what's in the surroundings? What do buildings normally look like in this neighborhood or in this scale? Why do they look like this? Almost as a way of defining a brief, but sometimes it's a positive brief that we establish a series of elements that we find desirable. Or we have a negative brief where we identify things that we think are mistaken, or certain opportunities that we would like to explore.

What you think of the state of tall building design right now?

It's a very broad field. I think that in general the majority of high-rises that are popping up in the Americas – and especially in the Middle East and Asia – are quite generic, conventional high-rises with all-glass curtain walls and some kind of an ornamental headpiece at the top to distinguish them from the neighboring towers. So I think it is definitely a field that seems to be somewhat inhibited in its capacity to identify interesting opportunities.

Do you find that, to address the mechanics and economics, you have to make more compromises in your design for a tall building than you would in other typologies?

No, I think you have certain givens and certain parameters that you have to work with, no matter what scale of a building you're working with. It's not like I think a tall building is more difficult to design than a short building. I think it's always true, whenever you're designing architecture, that the parameters you identify as key criteria in the beginning of the process become tools that you can work with. They become ingredients that you can use to create your design. Whereas the ones you fail to identify, they will come back and bite you because you didn't incorporate them in your thinking from the beginning. So that's why we hear about compromises when the fact is, for instance, (elements) like MEP or structure haven't been factored into the design process from day one.

You spend most of your time in New York these days. How is designing in America different than the rest of the world?

I think one thing that I would identify is that the whole process of designing and engineering a building has been Balkanized into armies of specialized consultants. The design process in Europe is much more unified. You have an architect that does everything: the design, the execution, the construction administration and the interior. You have an engineer that does structure, MEP, civic, the whole spiel. You have limits, but it also has a great potential for synergy between the different professions. In the American model it's a bit more of a challenge, because it's almost like one consultant finishes his or her job and passes it on to the next and the next and the next. Buildings end up being like an accumulation of efforts that are less integrated than they could have been.

You've talked about "hedonistic sustainability." What does that mean?

It's essentially the idea that sustainability doesn't have to be some kind of a downgrade of your lifestyle (and can) actually coincide with increasing life quality. I think there are a lot of examples where what makes a city more sustainable is also what makes it more enjoyable.

For someone who's willing to break away from the norm, you seem to have pretty good relationships with developers. What's your secret?

I think it's because we work with criteria. I love working with professionals, because professionals are quite often aware of what they're doing so they can actually come with quite clear criteria and they can come with specific briefs for their building. And they quite often have certain experiences with what hasn't worked for them in the past and why. So that means that we actually have a very clear client to collaborate with. Since the work we do is very much based on analysis and consequence we can turn those – let's call them limitations or parameters – into the driving force of our design, because we are really genuinely interested in discovering buildings that look different, truly because they perform differently. So it's not like we're coming with some kind of pre-conceived style that we always have to do. In each case, we somehow try to identify what is that true potential of the specific project. I think that makes us quite capable to collaborate with the clients.

What lingering impacts did your time at OMA have on what you're doing now?

I think the greatest education in architecture is to be a master's apprentice. You work with and for someone whose thinking you admire or whose work you admire. In that sense, I learned a lot working at OMA. It seemed like a major part of my education. At the time, I was working on the design of the Seattle Public Library (see Figure 8), which in a way is sort of like a high-rise library, and at the same time they were doing projects all over America and Europe. I identified the need, when you are operating in places outside your native environment, to really make an effort to instantly acquire and understand the conditions you are operating in. Understanding precedes action, and if you don't know, you can't act. So one of the most crucial things in architecture is to find ways of instantly acquiring knowledge of the place that you're going to be operating in.

There's always this desire to build taller. Do you buy into that? Do you think we should be growing taller?

I think there's a certain element in human enterprise that is about achievement and about pushing boundaries. I mean I would be surprised if in 1,000 years we only live on planet Earth. So in that sense, I think it is a very beneficial element of human nature to always want to explore: to explore cases and to explore boundaries, to create new possibilities.

How do you think tall buildings are going to be different in 10, 12 years? What breakthroughs are we going to see?

Yeah, I'm curious. We're doing one project in Korea, in Seoul, which is essentially twin towers (see Figure 9), but there are two towers stacked between them, sort of forming these hidden vertical communities with these Babylonian hanging gardens between the towers. I think maybe there's a tendency towards a more three-dimensional exploration of the life between the buildings, not only at street level, but higher. I think maybe also you will see a lot more effort in the transition from the streetscape to the tower. You might have a more gradual, more three-dimensional way of inhabiting space at the base of the tower.

Figure 9. #Towers, Seoul (Source: BIG)