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Title: **Standing Out by Blending in: Tower Infinity**

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Subjects: Architectural/Design  
Building Case Study

Publication Date: 2018

Original Publication: CTBUH Journal, 2014 Issue II

Paper Type:

1. Book chapter/Part chapter
2. **Journal paper**
3. Conference proceeding
4. Unpublished conference paper
5. Magazine article
6. Unpublished

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# Standing Out by Blending in: Tower Infinity – The “Invisible” Tower



Charles Wee

## Interviewee

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## Charles Wee

Charles' professional experience includes a wide range of large-scale master planning and mixed-use development projects throughout the world. Prior to founding GDS Architects, Charles worked as a designer under Anthony Lumsden for AECOM and AJLA.

His current projects include some of the largest and tallest high-rise mixed-use projects in Korea and China, including Tower Infinity, the “World’s First Invisible Tower” in South Korea, recent winner of Time magazine’s “Most Innovative Project” of 2013 and “The Most Contagious” Design award.

His work has been featured in numerous worldwide publications. Charles graduated with a Master of Architecture degree from the University of California Los Angeles.

In September 2013, GDS Architects received planning approval for the 450-meter, US\$400 million Tower Infinity in Cheongna, South Korea, between Incheon International Airport and Seoul. The crystalline observation tower quickly got picked up by the world’s media as the “invisible” tower, due to its clever use of an array of LEDs and HD cameras built into the façade, which give the ability to become “almost invisible.” CTBUH Editor Daniel Safarik spoke to GDS principal Charles Wee about the plans for executing this audacious project.

## Give us a little background on the project.

I think the invisible tower thing just somehow captures imaginations. It’s got a crazy history. We’ve actually been working on this project for seven years.

Basically, there have been two presidents, two ministers of construction, two presidents of the land and housing corporation since I’ve been working on this project. So each time those guys change, the project dies and then another guy comes in and revives it. Finally, in 2013 we were able to get the building permit.

## What inspired you to make something that was presented as invisible?

Back in 2007 when we entered the design competition, this “invisibility” thing really came about starting with the notion of redefining a “landmark” or “monument.”

We’ve been working in Korea since 1991 and have probably done 30 competitions in Korea alone, and I don’t think I remember a single

brief that did not say they wanted a “monument” or “landmark.”

I really got sick of that, actually, because that means an entire country would just be filled with landmarks and monuments. We started saying, “let’s throw that preconception out.” Let’s call this an “anti-monument” and just take an opposite approach to everything.

## So you deliberately went against the culture with this design.

I’m a Korean-American. I was born in South Korea, and I came to the United States when I was very young. Being in Korea as a professional from 1991, I kind of have a love/hate relationship with the country. I see so many vanity projects, and I wonder, “Why do you guys need another polished building in the world?” This design was almost a commentary to say, “Let’s not fall into that trap of a meaningless race.” Instead, let’s have the chance to show the world that Korea is not really worried about making the tallest, most pristine buildings. Let’s do something more powerful in its meaning.

Korea already has a pretty amazing position in the world. We don’t need to show off anymore. And so our first design-panel catchphrase was, “It’s the most visually striking landmark in the world – because it’s invisible.”

**The first practical question that comes to mind is, how is this not an aerial navigation hazard? I’ve seen some renderings that seem to have been taken from a nearby airplane.**

Yes. It is actually 20 kilometers from Incheon International Airport, so we had to do a lot of

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simulations. Fortunately we were just outside of their primary flight paths. There will be aircraft warning lights at the top intersections, where our facets are. People are confused right now because they really think that the tower is shrouded and invisible constantly, and while we really would have loved to have done that, it would have been an astronomical cost.

It's basically designed so that it is shrouded from an eye-level perspective from right up close, about 20 meters, all the way back to about 2 kilometers. As you enter Seoul via the Incheon Bridge, the tower is strategically located along that view corridor. But from above you will always be able to see the tower in full (see Figure 1).

#### So a pilot will see it like an ordinary building?

Oh yeah, it is not at all a navigation hazard. We had to get a permit for it. In fact, a main obstacle was the North Korea threat. A few years ago their missiles were fired from a spot not far from our site. So, during our permitting process, South Korea officials put the whole thing on hold for about three months, because they objected to the positioning of our tower. They were concerned that it would be in the line of fire if North Korea were to attack. I don't think that I can get into all of the specific security stuff, but we worked with the military to satisfy their concerns. It was actually harder to get that permit than the aviation permit.

#### So was your original plan accepted in full?

They accepted most of our program. But the issue that they have now – and it's a pretty big issue – is that the original design calls for this 450-meter-tall tower, but all these program elements were scattered around: a theme park, a wedding ceremony place, a water park, and a museum. Because of the budget, the land and housing corporation would only pay for the tower. So what they are looking for now is a partnership to codevelop the podium, but they are going ahead with the tower. These programs were intermingled with the business plan, to make money for the building. We are looking for an operator now. And maybe when the operator

comes in, some of the programs will change, but some of those primary programs are already set as part of the plan, like a 300-seat IMAX theater right at the middle, at around 240 meters above grade.

#### How exactly does this LED system work? The impression that I got is that it reflects back the landscape adjacent to the tower, so it appears to disappear.

It's a little bit more than that. The system we decided on is simple and reasonable in cost. You can have a pitch [distance] of 229 millimeters between bulbs, so that, as you are looking at the surface from so far away, you can see it in higher resolution. So at the bottom third was a 15-millimeter pitch, and it transitions to a 300-millimeter pitch at the top. At each facet intersection, we have 18 high-definition cameras. We have three sets of six cameras, one at every intersection of the hexagon, and they capture everything at 360 degrees. So we would have people gather at the time when we would cloak the building, and all the cameras that are capturing the people who are looking from one direction would get captured and projected to the other side. What the people are looking at gets processed on this HD video software that simultaneously edits, rotates, adjusts, and stitches this seamless picture, which gets projected on the side opposite the view it captured, and blends the projection surface into the background.

#### What kind of images can people expect to see?

Hopefully trees, or sky, or sunset – whatever is happening on the opposite side. The same technology becomes a billboard at night. Imagine the revenue potential of the tower becoming a giant TV screen. There are 35 million passengers that come to Incheon per year, and if 20 million of them go across the bridge, that means 20 million potential visitors.

#### How did you control the budget?

A really good curtain wall can run 15 to 25% of the budget. But remember, this is not a full



Figure 1. Tower Infinity, Cheongna.

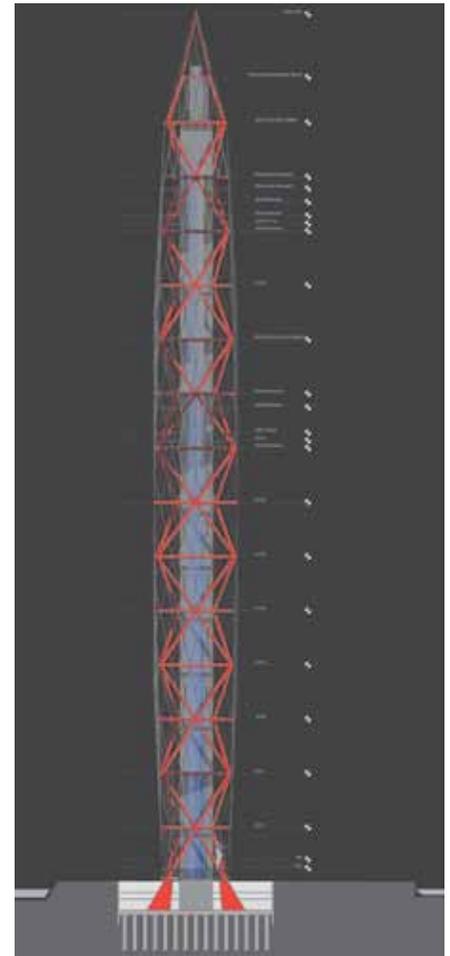


Figure 2. Overall section.

office building. So only 30% of the spaces are occupied, and the other 70% is just sky rides. We have one kind of glass for each condition.

#### What kind of design adjustments did you have to make to support an exterior skin that would incorporate the LED system?

The structural system integrates a reinforced concrete core, which acts like a giant megacolumn (see Figure 2). That gets linked to a steel-floor beam system with a perimeter link beam at every 28 meters. So as the tower goes up 450 meters, these horizontal systems basically come in every 28 meters. It is connected by what we call a double-helix

mega-diagonal cross-bracing, which creates a double helix with two Vs, but one V goes outside the tower and the other goes from the tower into the core (see Figure 3). So when you put it all together it comes out as a very beautiful structural expression.

That double helix finally gets connected to the exterior diagrid structure that spans 28 meters. So each diamond is 28 meters, but that diagonally shaped diamond covers the entire surface of the crystal facet, so at the end you have this very strong cage. For the secondary steel system, within the one diamond, there are 16 modules, and that becomes the secondary structure which holds all the glazing.

**So the structural design of the project is at least as much of the story as its “invisibility.”**

One thing that is very important to this project – and we must have built 50 models to prove this – is that one tiny little change in the geometry would cause every other geometry to go out. So we had to play this puzzle game to ensure that we had a workable system. If you look at the design, it is not perfectly symmetrical. I wanted it to look more natural, like a diamond. Sixty percent of the glazing is an exact triangle, not a trapezoid, because if we change a trapezoid, the whole thing goes crazy.

So on the occupied floors, the façade is a 54-millimeter-thick triple-glazed low-e glass, and the non-occupied floors have 18-millimeter-thick laminated glass. And all the LEDs are spaced at a 300-millimeter pitch, embedded into a horizontal bar, right inside the curtain wall, which just touches the glass. Another thing we had to spend much time on was to make sure the LED bars did not block views from the platform.

**It seems that this is being done for such a specific effect, and if the lighting and structural systems did not work together as intended, the whole aesthetic of the tower would be lost.**

I have a problem with observation towers. Everyone seems to design them as “lollipops.” Ironically, that is the worst kind of structure, to have the heaviest mass on top, for wind or earthquakes. So that drove my approach to the geometry. We did get flack for not having a larger observation tower, but I wanted to balance the aesthetic and [structural] system. With our project we wanted to break the mold of that lollipop, so we did not do an imbalanced top. Instead, we stacked floors.

There are about 15 stories in there, seven in the center, and about five on the top. And they are connected vertically with restaurants and skywalks and venues that are vertically organized, so you look up at 80 meters of

open space that is sectionally cut. It will look like a huge cathedral instead of a claustrophobic ceiling (see Figure 4).

**So, this tower is meant to be looked from, and it is also something to be looked at with this LED system, and then you have something to be regarded from within itself, so you can appreciate the structure in section.**

Cheongna, the neighborhood where the project is, translates to “Blue Jewel,” so the interior is themed around jewels. There is a “sapphire zone” and a “ruby zone,” so when we did this crystal, it seemed a perfect fit with the city, which helped us to get the project.

**What is your completion date?**

When they announced the winner, it was 2008, and they wanted it completed by the Asian Games of 2014, which is not happening. The completion date I can’t quite say, but we just got the permit. Construction should not take more than three years. Korea has some of the best contractors, so we are thinking maybe 2016 or 2017. The Korean government was wise enough not to say it was for the Games, and they advised we take our time to build this correctly. ■

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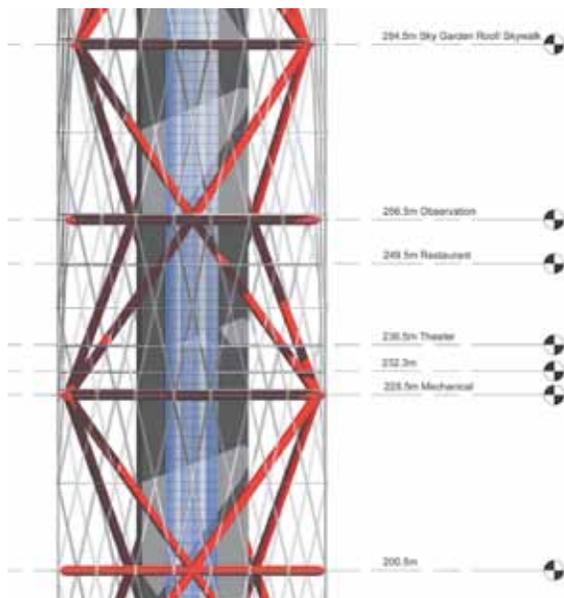


Figure 3. Section detail.



Figure 4. Observation deck.