The Gensler Approach
Maximizing The Design Experience
We Design...
We Design...
We Design...

20,000 SF

2SF
We Design...

20,000,000 SF

20,000 SF

2SF
Gensler Practice Areas

20 Practice Areas

DIVERSE KNOWLEDGE
INTEGRATED APPLICATION
INNOVATIONS ACHIEVED

1. Aviation + Transportation
2. Brand Design
3. Commercial Office Buildings
4. Consulting
5. Creative Media
6. Education + Culture
7. Financial Services Firms
8. Headquarters
9. Health + Wellness
10. Hospitality
11. Mission Critical Facilities
12. Mixed Use + Entertainment
13. Planning + Urban Design
14. Product Design
15. Professional Services Firms
16. Retail
17. Retail Centers
18. Science + Technology
19. Sports + Recreation
20. Workplace
43 locations around the globe:
2000+ Clients
2000+ Clients

4600+ Projects
2000+ Clients

4600+ Projects

86 Countries
Clients
Gensler Toolkit

**Software**
- Autodesk Revit
- Autodesk 3ds Max
- Trimble SketchUp
- iRAY
- Rhino
- Adobe Creative Suite
- V-Ray
- Pano2VR
- Unity
- Octane
- And much more

**Hardware**
- **Lenovo ThinkPad W530**
  - i7-3820QM (2.70GHz)
  - 16GB RAM (2x8gb)
  - 256GB SSD
  - **NVIDIA Quadro K2000M**
- **Lenovo ThinkStation D30 4223E79**
  - Intel Xeon E5-2630 Processor (x2)
  - 32GB RDIMM Ram
  - 256GB SSD
  - **nVIDIA Quadro 4000-6000**
Shanghai Tower Construction and Development Co., Ltd.
Shanghai Tower
Shanghai, China
Construction moves ahead as the technical complexities of the tower’s structure, glass enclosure, and mechanical systems are skilfully managed.

Gensler’s vision for Shanghai Tower has taken tangible form after completion of the immense foundation. Soil conditions in Shanghai—a clay based mixture typical of a river delta—meant supporting the tower on 831 reinforced concrete bore piles sunk deep into the ground. For three days, a small army of workers assembled to complete the marathon, 60-hour continuous concrete pour. When the job was finished, more than 60,000 cubic meters of concrete had been used to create the six-meter-thick mat foundation.

The tower’s scale and complexity have created so many “firsts” for China’s construction industry that more than 100 expert panels have been established to analyse every aspect of the design. Workers are busy building forms for the concrete core and erecting the gigantic composite supercolumns—measuring 5 x 4 meters at the base and reinforced with steel plates that weigh 145 metric tons each—that will provide structural support for the tower. To carry the load of the transparent glass skin, Gensler designed an innovative curtain wall that is suspended from the mechanical floors above and stabilised by a system of hoop rings and struts. And the strategic division of the tower into nine vertical zones will supply the lifeline of the building’s heating, cooling, water, and power throughout with less energy and at lower cost.
With integrated design and technology, Shanghai Tower embodies a new understanding of the super-highrise building and its place in the 21st-century city.

**INNOVATION TAKES THE PRIZE**

Gensler won the Shanghai Tower project in an invited multi-stage competition among leading international architects. What sealed the win were the tower’s design and performance, and Gensler’s commitment to China. To refine the tower’s shape, Gensler’s team used a series of wind tunnel tests to simulate the region’s greatest natural force, the typhoons. Results produced a structure and shape that reduce wind loads by 34 percent—ultimately yielding a savings of $38 million in construction costs. A simple structure, public spaces within the double façade, and sky gardens based on Shanghai’s traditional open courtyards will make Shanghai Tower an unrivaled asset for the local district.

![Wind tunnel model](image1)

**Shaped to reduce wind loads**

Gensler’s design team anticipated that three important design strategies—the symmetry of the tower’s form, its tapering profile, and rounded corners—would allow the building to withstand typhoon wind forces common to Shanghai. Doing wind tunnel tests, Gensler and structural engineer Thornton Tomasetti refined the tower’s form, ultimately reducing building wind loads by 34 percent. The result is a simpler and lighter structure with unprecedented transparency and a 34 percent reduction of costly materials.

![Wind tunnel model](image2)

**Many options were studied, but wind tunnel tests pinpointed a 120-degree rotation as optimal for minimizing wind loads.**

![Wind tunnel model](image3)

**Benefits of the double skin**

The innovative design incorporates two independent curtainwalls—the outer skin and inner-chamber planes, the inner wall is circular. The space between the two forms provides, a sun shade for the inner skin of the building at regular intervals throughout the building. The sky gardens will improve air quality, create visual connections between the city and the tower’s intentions, and provide a place where building users can interact and relax.

![Wind tunnel model](image4)

**Landscaped atriums are located at regular intervals throughout the building.**

![Wind tunnel model](image5)

**The landscaped sky gardens will be social and retail hubs for each neighborhood within the building.**

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**Design Firm:**
Gensler

**Location:**
Shanghai, China

**Completion:**
2014

**Structural Engineer:**
Thornton Tomasetti

**Wind Tunnel Testing:**
Gensler

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**Notes:**

- A 1:6 model of the tower passed a shake table test simulating earthquakes measuring up to 7.5 on the Richter scale.
SHINGLE HORIZONTALLY – “Wide Stack Joint”
NUMBER OF PANEL TYPES = 10 panel type per floor;
Total of 120 types different panel types.

WALL TYPE A
WALL TYPE B
WALL TYPE E

SECTION PERSPECTIVE
透視圖
18% more Glass

Quantity of Panels:
Glass Panels: +/- 19,000

Quantity of Panels:
Glass Panels: 15,934
The outer skin gradually narrows at each floor level, giving the glass tower an elegant tapered profile. A V-notch in the curtain wall accentuates the spiraling geometry.

Conservation of light pollution had significant impact on the design of the outer curtain wall. Building codes in China’s urban districts are highly sensitive to the impact of sunlight reflecting off glass facades toward surrounding buildings. Two curtain-wall schemes—a “staggered” and “pushed” were studied extensively. The tests revealed that a staggered line of fluctuating light vertically was superior to a smooth slab of angled glass, which would reflect much more light onto neighboring buildings.

The outer curtain-wall design incorporates steel columns at each floor level, producing the preferred staggered configuration.

Light reflectance off the curtain wall was modeled using extinct software, which showed that the “staggered” curtain-wall design was much more desirable.

A floor-trained super-highrise tower

This series of drawings illustrates the layers of structure: composite floors, inner slabs, and exterior curtain wall.

- Core
- Double belt trusses
- Outrigger
- Beam
- Super column

The simplicity of Shanghai Tower’s design in response to many challenges: a windy climate, an active earthquake zone, and key-bearing soils. The heart of the structural system is a concrete core. The core acts as an inner wall on outrigger and superstructures, with double belt trusses that support the base of each vertical neighborhood. This results in a simpler and faster construction process—a significant cost savings for the client. 
SELF-CONTAINED CITY

Shanghai Tower is a city within a city comprising nine vertical zones, each 12 to 15 stories high. Each zone is incased by public space within the double-skin façade. Within each neighborhood, a mix of uses caters to the daily needs of occupants. Separate elevators shuttle people among zones, and below-grade parking links via walkways to the nearby super-highrise tower.

Zone 9
Observation/Cultural facilities

Zone 8
Hotel/Boutique office

Zone 7
Hotel

Zone 6
Office

Zone 5
Office

Zone 4
Office

Zone 3
Office

Zone 2
Office

Zone 1
Retail

Observation level
The highest of the nine zones houses public amenities: gourmet restaurants, an exhibition center, and enclosed and open observation decks served by the tallest single-lift elevator in the world.

Offices
Zones 3 through 6 are comprised of high-performance offices, all of which are filled with natural light and connect to the atriums with expansive views of the city.

Sky lobbies
Each office zone rises from a sky lobby at its base—a light-filled garden atrium that fosters community and supports daily life. Shops and restaurants in each lobby lower the demand for trips to the ground level, which saves energy.

Retail podium
Zone 1 is the base-level retail podium of luxury boutiques, high-end dining destinations, cafes, and lounges. The hotels’ conference, banquet, and spa facilities also occupy space in the six-story podium.

Ground-floor lobbies
Both the office tower and the hotel/conference center functions will be accessed through separate, dedicated lobbies rendered at a scale fitting to the tower.
Shanghai Tower will be one of the most sustainably advanced tall buildings in the world—designed to achieve both LEED® Gold certification and a China Green Building Three Star rating. The sustainability of the tower grows out of Gensler’s integrated approach to its design, using simulation studies to optimize overall building performance. Wind tunnel testing of the tapered, asymmetrical tower focused on defining the optimal shape of the exterior skin and showed that reducing wind load makes for a lighter, more efficient structure that conserves natural resources.

A central aspect of the design is the transparent, second skin that wraps the entire building. The ventilated atriums it encloses conserve energy by modulating the temperature within the void. The space acts as a buffer between inside and outside, warming up the cool outside air in winter and dissipating heat from the building interior in the summer. Mechanical equipment is spaced strategically in each zone of the building to provide optimal flexibility, reduce operating costs, and conserve energy. As Gensler’s founder, Arthur Gensler, told The International Business Times, “We hope Shanghai Tower inspires new ideas about what sustainable tall buildings can be. We’ve lined the perimeter of the tower, top to bottom, with public spaces, and we’ve integrated strategic environmental thinking into every move.”

As a global leader in sustainable design, Gensler designed Shanghai Tower to incorporate green strategies that will long demonstrate the city’s commitment to an environmentally responsible future.

Shanghai Tower is targeted to reduce water consumption by: 21%

Shanghai Tower is targeted to reduce energy use by: 40%
GREEN STRATEGIES
Sustainable design is at the core of Shanghai Tower's development. To achieve the LEED Gold and China Three-Star ratings, Gensler incorporated many strategies that will generate a positive environmental impact.

The foundation of this approach is state-of-the-art water resource management practices and high-efficiency building systems. A full 33 percent of the site is green space, with landscaping that blankets the entire site from the city and shades paved areas that radiate heat. Locally sourced materials with high recycled content are being used when available. And the building’s heating and cooling systems use the power of geothermal technology to deliver energy from fluids maintained at the earth’s constant temperature.

Daylighting
The continuous glass skin admits the maximum amount of daylight into all areas, reducing the need for artificial lighting. Floor-to-ceiling glass in the hotel facing public areas benefits to those spaces.

Sun-shading
To reduce heating and cooling loads, both the inner and outer curtain walls will have a spectrally selective low-E coating. Fritted glass on the outer wall provides additional sun-shading, aided by horizontal ledges at each floor level that will block high summer sun.

Cogeneration system
The 2,200-kW natural gas-fired cogeneration system provides electricity and heat energy to the low zone areas. In addition to providing site-generated power, the system produces 640 tons of refrigeration during the cooling season and heat during the winter months.

Landscaping
One-third of the site will be dedicated green space, with extensive planting to lessen the heat island effect of paved areas. Efficient irrigation systems, combined with plant materials requiring low watering, reduce overall water consumption.

Building envelope
The building’s two curtain walls create an atrium that acts as an insulating blanket, reducing energy costs. Used indoor air is circulated through each atrium to temper the space, keeping the warm heat out in summer and the building’s heat in during winter.

Building controls
Shanghai Tower incorporates intelligent building controls that lower energy costs by monitoring and adjusting systems such as lighting, heating, cooling, ventilation, and self-generated power. Lighting controls alone will save more than $516,000 each year in energy.

Regional materials
The team seeks out building materials that are harvested and manufactured within an 800-kilometer radius of the site. Local sourcing of products is sustainable because it reduces transportation-related environmental impacts and boosts local economies.

Regional materials

Shanghai Tower’s sustainable strategies will reduce the building’s carbon footprint by:

34,000 metric tons per yr
The Richards Group
Dallas, Texas
What do you do when your client wants a 100% transparent façade on a limited budget?

**Variable Opacity Façade** A mutable façade design that can be changed interactively while providing cost, performance, and aesthetic feedback in real-time.
What they want

100% Transparency

What they can afford

<65% Transparency
**Conventional Opacity**
1. Transparency = 65% of surface area
2. Opacity is continuous and horizontal. No full height glass
3. Featured Building Element is bounded by hard edges.

**Distributed Opacity**
1. Transparency = 65% of surface area
2. Opacity is distributed. Full height glass
3. Featured Building Element is bounded by a soft edge.
We used Grasshopper to combine interactive design with real-time energy and cost feedback.

80% Transparency

23% Randomness

23% Glass type B

$150/SF Building Cost
Unitized Curtain Wall Panels allow for the efficiency of modulation with the flexibility to create a random pattern.
Result: The central meeting and circulation atrium required the most transparency. The rest of the façade consisted of opaque ceramic-faced and glass panels with two grades of reflectivity.
Result: The successful method has now been implemented for another client, this time on a speculative office building wanting to break the conventional expression of a value-market spec building, while maintaining a comparable budget.
Confidential Project
Get Started...

1. On your iPad or iPhone, open the App Store and in the search field type "Gensler Free".
2. Tap on the "Get" button, and tap again when it changes to "Install App".
3. When you are prompted, enter your Apple ID password.
4. Wait a few moments until the installing button "Open" appears.
5. Tap the "Open" button, tap "Open" again, and select "Trust".
6. Return to the home screen.
7. You can choose to show scan to enter your current location or room and proceed.

Position the QR Code located on Side 1 of the coaster in your iPhone's Viewfinder and you are inside the building.
123 Mission Street - Mission Street Lobby
San Francisco, California
SKANSKA - Capitol Tower
Houston, Texas
Recap:

Shanghai Tower
The Richards Group
Augmented Reality Project
123 Mission Street Lobby
Capitol Tower
Q & A