

Assignment 5: Environmental Building Design Case Study Shanghai Tower

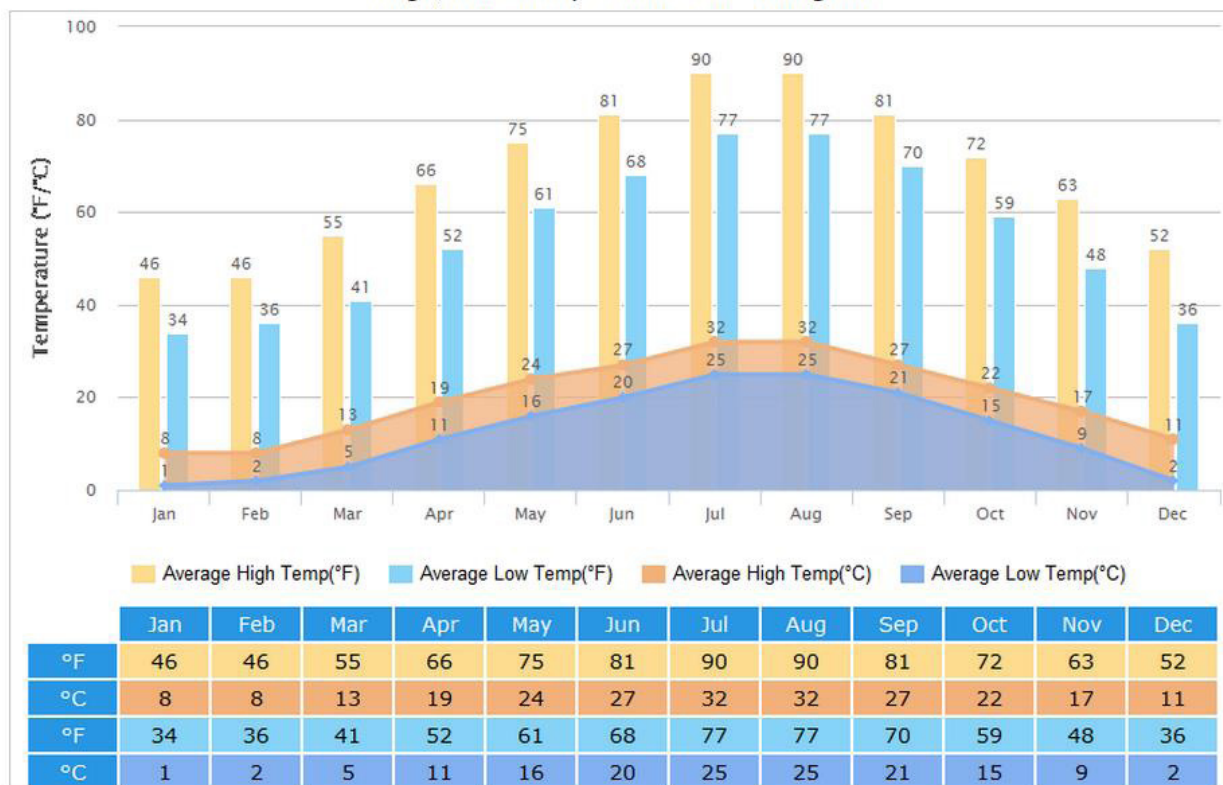
Basic Information



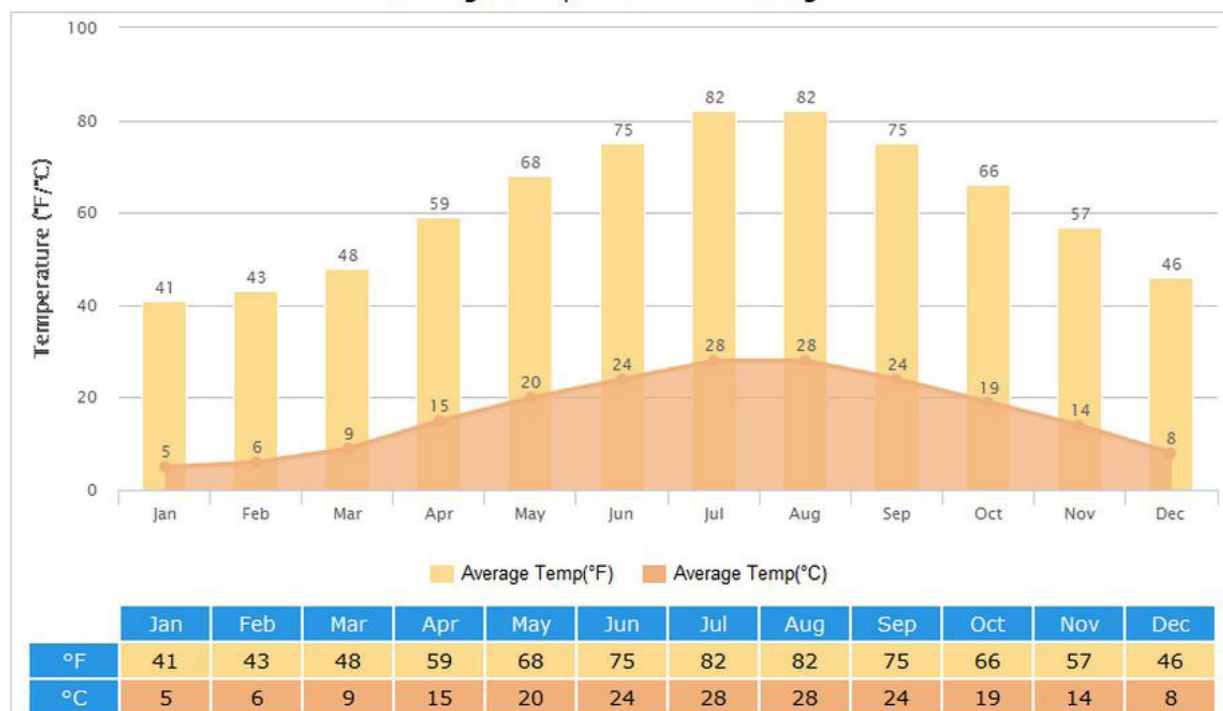
Height:	632m (2073ft)
Project Year:	2015
Location:	Lujiazui Financial Center, Pudong New Area, Shanghai, China
Architect:	Gensler
Engineer:	Thornton Tomasetti
Building Facade:	Aurecon
Landscape:	SWA
Total Above Grade:	380,000 m ²
Structural System:	Super Column-Concrete Core-Outrigger
Energy Label:	LEED Platinum BD+C: Core and Shell

Climate

High/Low Temperatures of Shanghai



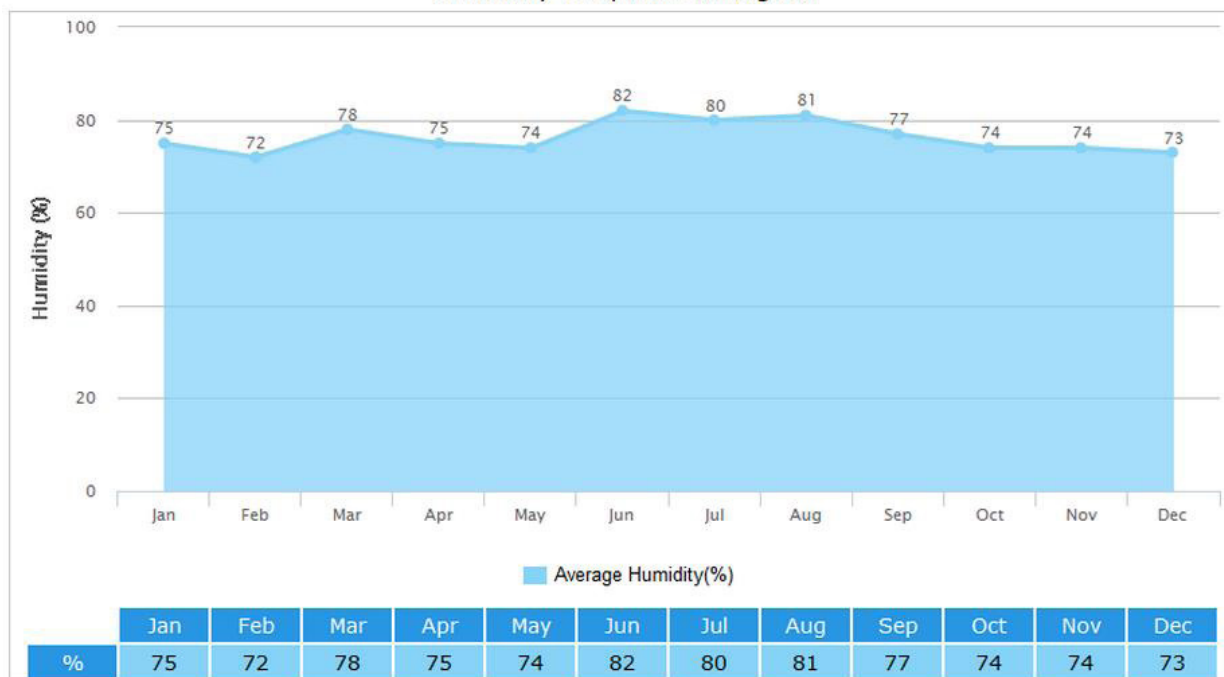
Average Temperatures of Shanghai



- Shanghai has a humid subtropical climate. It is generally mild and moist, with four distinctive seasons - a pleasant warm spring, a hot rainy summer, a comfortable cool autumn, and an overcast cold winter.
- The temperatures are not extreme. The weather of Shanghai in July and August is the hottest, with more than 10 days' high temperatures above 35 C (95 F). The coldest period is from late January to early February, with an average low of 1 °C (34 °F).
- The location at the estuary of the Yangtze River to the East China Sea makes the city so wet that it rains for about one third of the year.

Climate

Humidity Graph of Shanghai



Average Rainfall of Shanghai



- The annual precipitation is 1,200 mm (47 inches). June through to September are the rainy months.
- From late August till early September, Shanghai is frequented by typhoons and rainstorms, but they rarely cause any considerable damage. When traveling in Shanghai during these periods, prepare your umbrellas or raincoats.
- The humidity is pretty high in Shanghai, which is over 80% in Summer.

Environmental Design Strategies

GREEN STRATEGIES

Shanghai Tower will achieve both LEED Gold certification and a China Green Building Three Star rating.

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

25^k
METRIC TONS
PER YEAR

LANDSCAPING

One-third of the site is green space, with extensive landscaping that cools the grounds.



DAYLIGHTING

The glass skin admits maximum daylight, reducing the need for electric lighting.



GENERATING POWER

Exterior lighting for the tower will be powered by 270 wind turbines built into the façade.



DOUBLE FAÇADE

The buffer space in between acts like an insulating blanket for the tower, which saves energy.

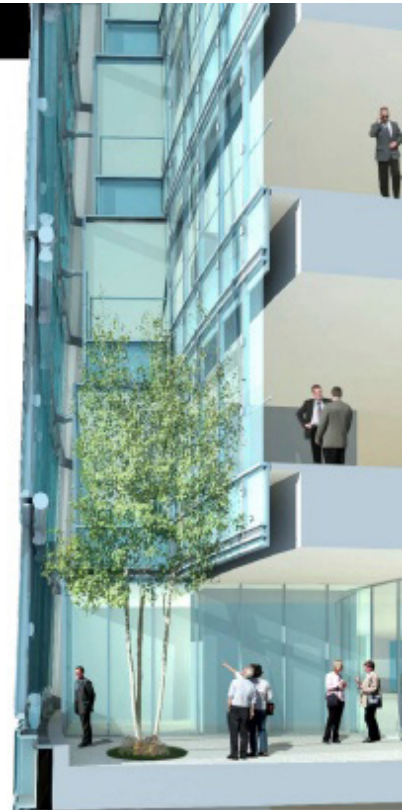
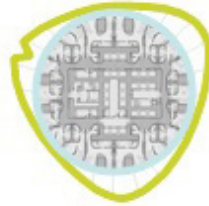


- Shanghai Tower is one of the most advanced sustainability tall buildings in the world, showcasing green technologies as part of its public awareness program.
- The central aspect of the design is the transparent second skin that insulates the building, reducing the energy use for heating and cooling.
- The design leverages state-of-the-art water conservation practices, high-efficiency building systems and its own power generating system for parts of the tower.

INTELLIGENT SKIN

Double skin acts as an insulating blanket, keeping the sun's heat out in the summer and the building's heat in the Winter, at the same time letting the maximum amount of light in to reduce the need for artificial lighting in the day.

Wall Type: **A** **B**



WIND TURBINES

Wind turbines at the top of the building will power the lighting for the building.



54,000
kWh/year

Power Production
(Renewable Energy)

45
Turbines

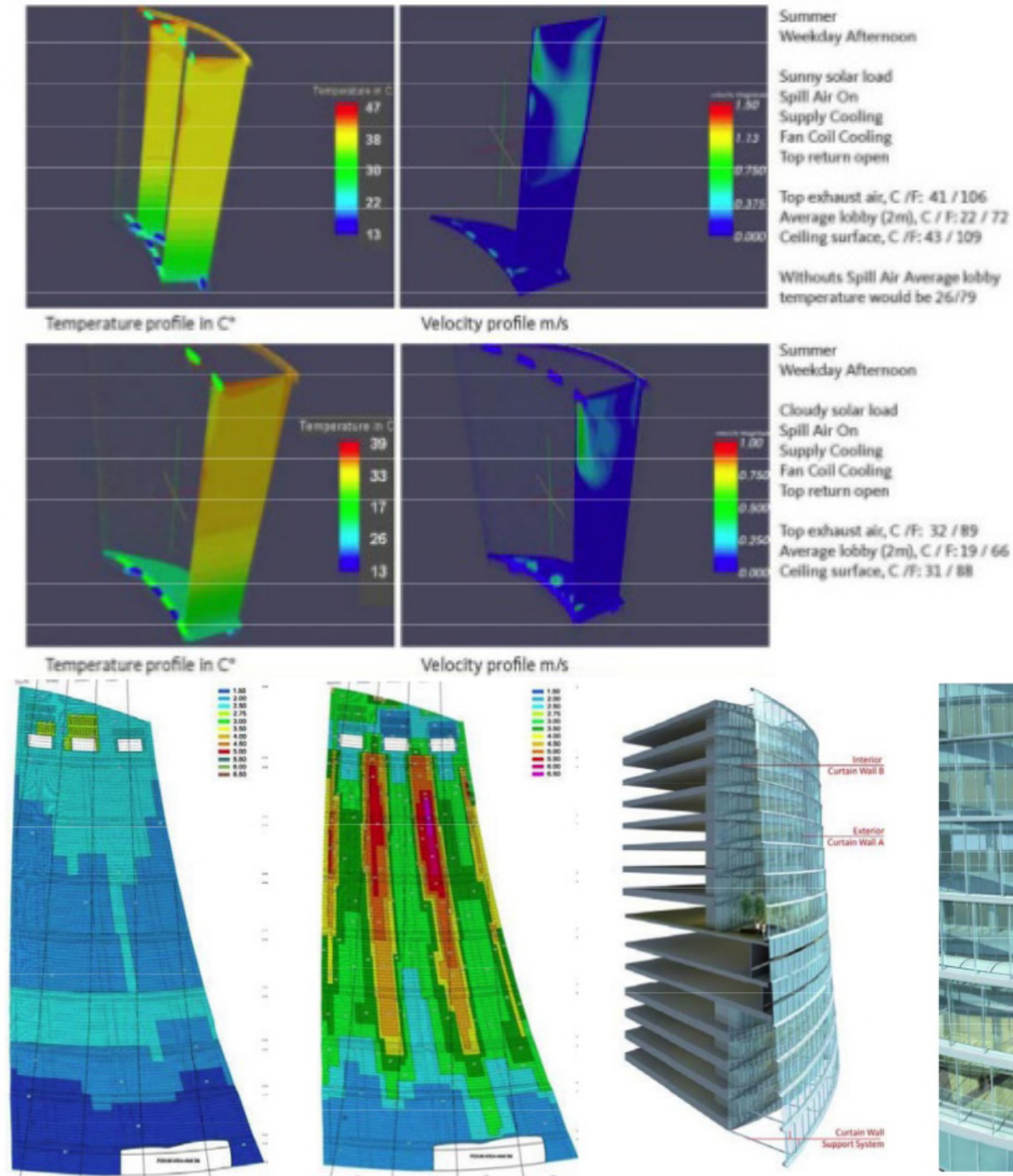
15 Turbines x
3 Turbines High

4
m/s

Wind speed at
580m height

- There are many northwestern and southeastern winds through out the year.
- The Average annual amount of sunlight is 1,547 hours, with insulation varying from 2.56 to 5.15 kWh. m²/day.
- The fact that this final value can be charged independently allowed for great flexibility in the design stage, especially in selecting the best combined overall building performance.

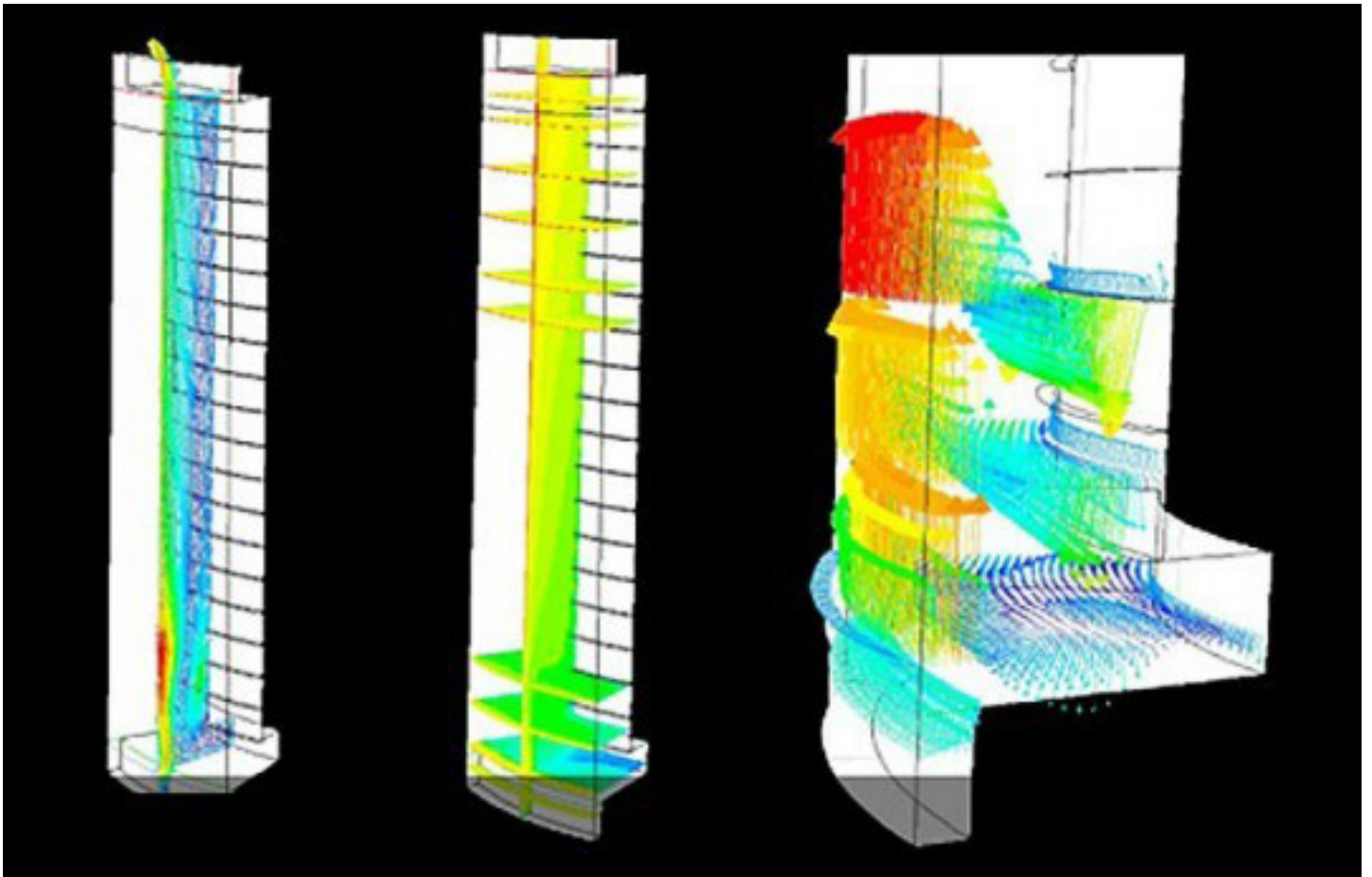
Curtain Wall Support System



- The main feature consider red for the exterior wall performance is based on a bio-climatic concept of a passive atrium system, where two skins area located in such a way as to create a large, full-height atrium space capitalizing on all the benefits that captured air - and the natural convection of air can provide.

- A completely passive 'greenhouse' effect could not be utilized alone for the atrium, there is minimal need for additional cooling and heating, and total thermal stress and energy use in office spaces and the hotel are significantly reduced, as confirmed in energy modeling.

Improvement



- If I was in charge of the project, it is better to make the facade performance more averagely according to the diagram above. Although the spiral form brings many benefits to the sustainability performance, the offices around still cannot absorb sunlight energy on average without mechanical system.