

建築思潮評析

Sustainable Design- Case Study

M9913001王珮如
指導老師 施植明

- 從本學期學習《The Philosophy of Sustainable Design》的內容，衍生出一套檢視、觀摩永續建築的方法。並從案例分析來了解書本知識在實務上如何應用。
- 針對辦公建築做案例分析，探討永續議題與人的關係。

Case Study 4

Swiss Re Tower

Foster + Partners

Location

Design

Diagrid

Space

Strategies

Analysis

Swiss Re HQ, 30 St Mary Axe

Foster + Partners

建築師 Foster + Partners

結構工程師 ARUP

地點 London, UK

建造期間 1997~2004

樓層 41層(地面層40層)

樓高 180 m

總樓地板面積約 76,400 m²

LEED Level Golden (39 points)

RIBA Stirling Prize

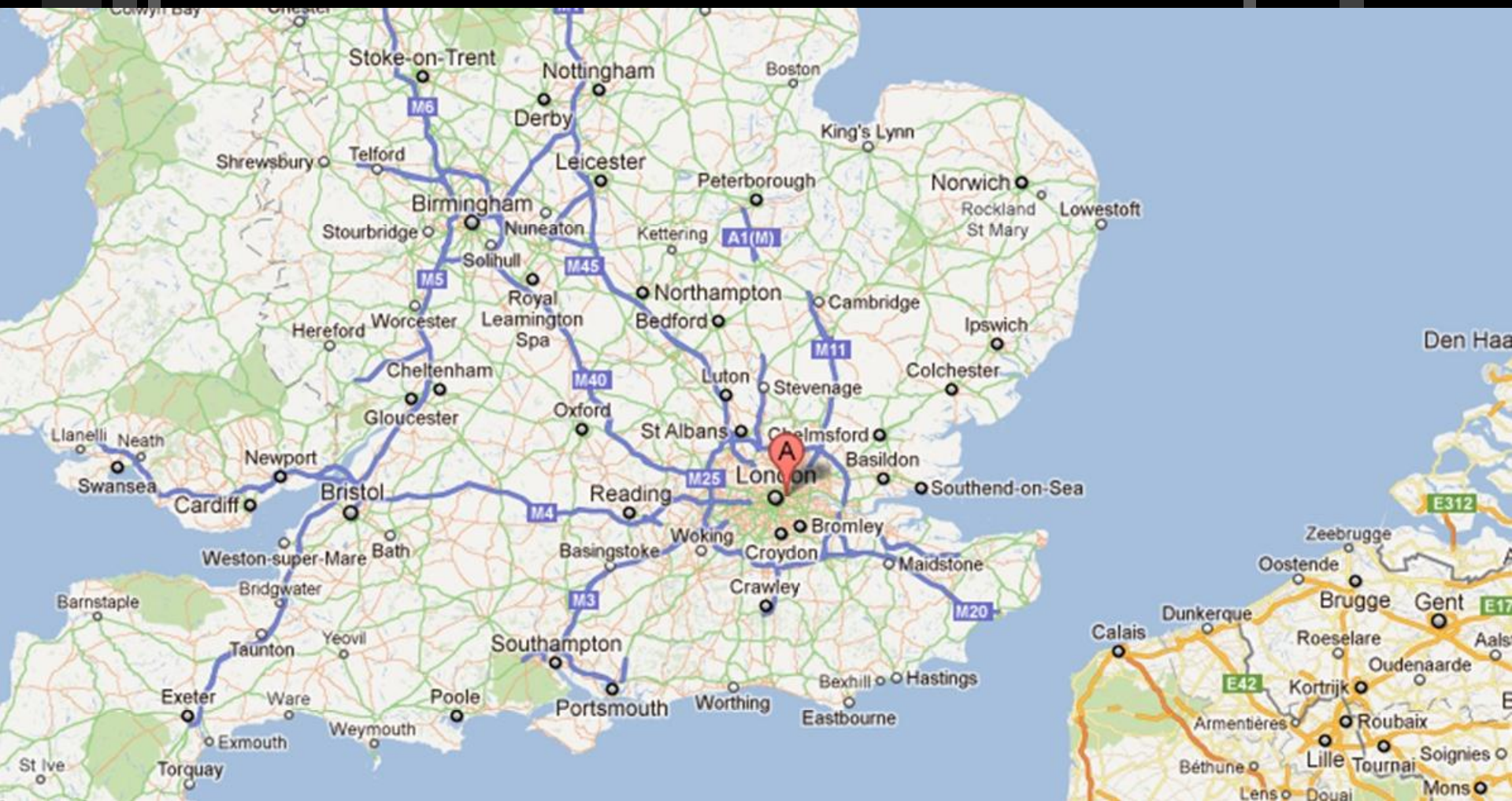


London's first ecological tall building and an instantly recognizable addition to the city's skyline, 30 St Mary Axe is rooted in a radical approach - technically, architecturally, socially and spatially.

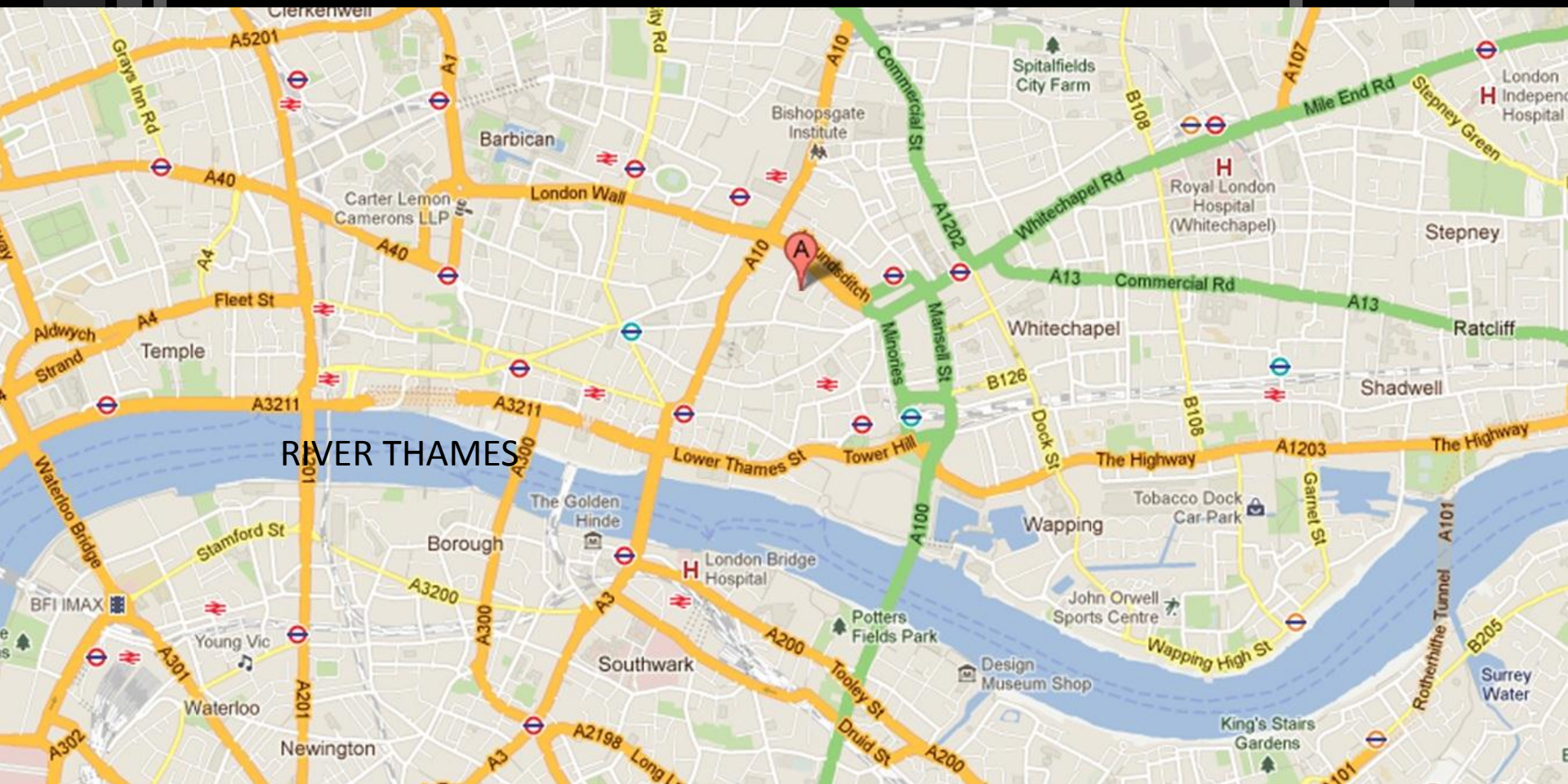
Location



Location



Location



Location



Lloyd's building

Leadenhall building

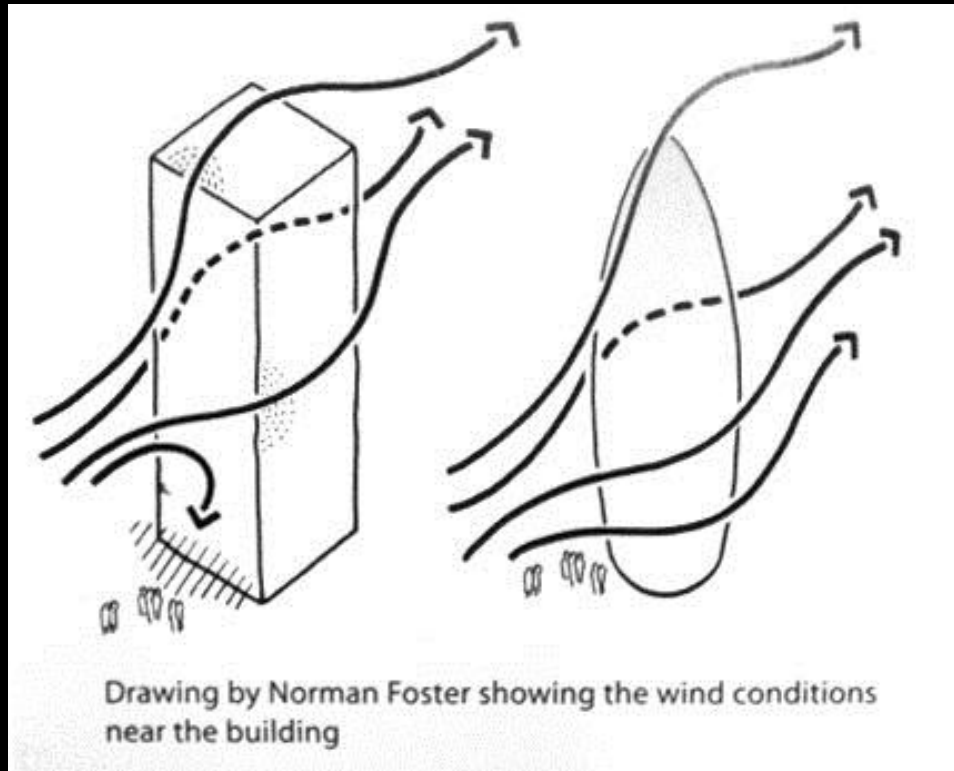
Gherkin



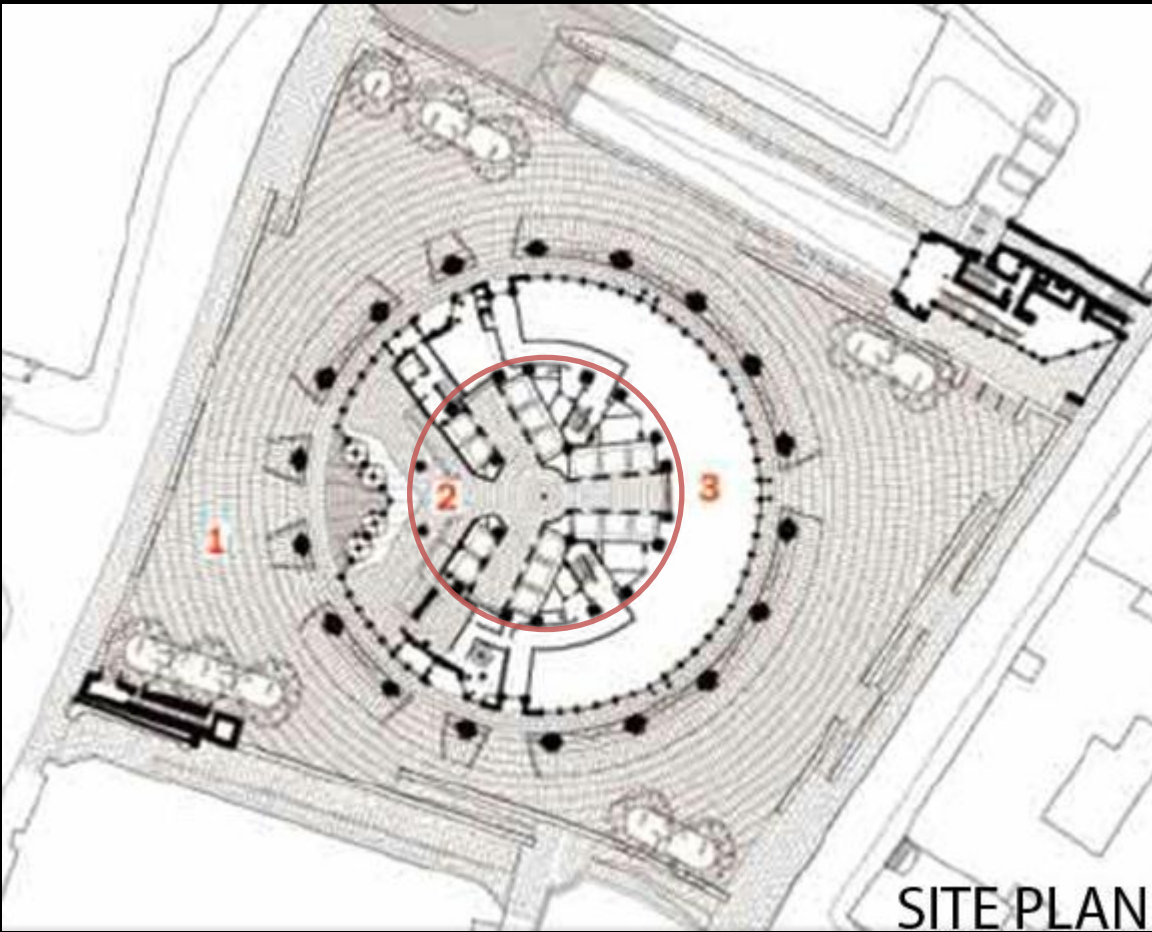
Design

Foster and Partners' aim had been to create an "environmentally responsible building with **natural economy of form** and a detailed understanding of **the urban context** in which it is placed." The result is a building that is radical "socially, technically, architecturally and spatially."

- The shape of the tower is influenced by the **physical environment** of the city. The smooth flow of wind around the building was one of the main considerations.



Space

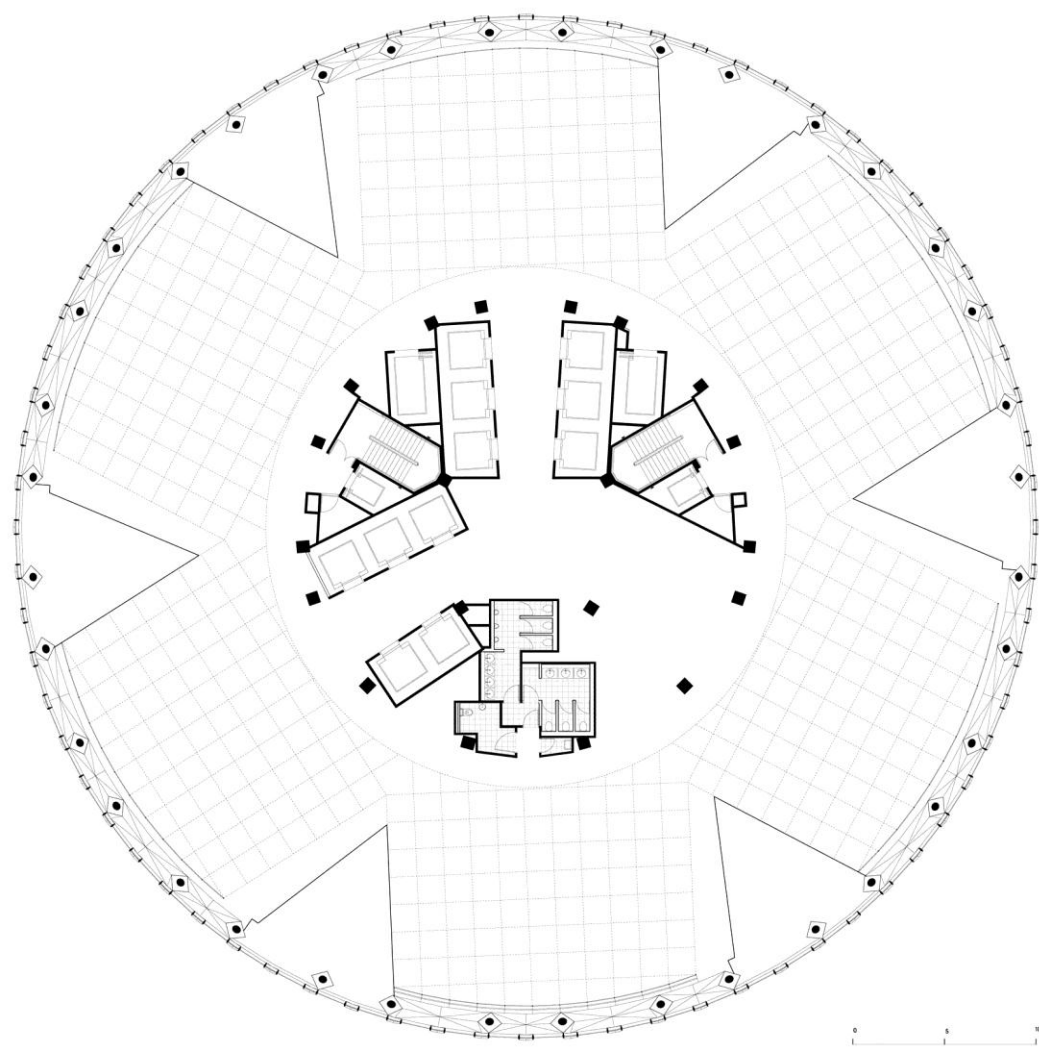


- 圓形的平面，降低因基地狹隘的壓迫性，且讓地面層四周皆有良好的空間品質。
- 入口方向回應街道及周圍著名建物。
- 每層的直徑隨大廈的曲度而改變，由48.6m至56.15m(17樓)，之後續漸收窄。以此方式，可降低建築物對周圍狹小街道的壓迫感。
- 大廈首兩層為商場，最頂的二層是360度的旋轉餐廳和娛樂俱樂部。

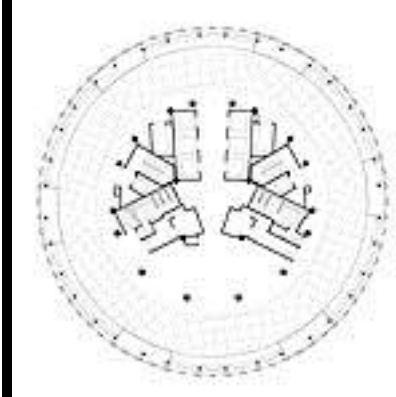
1.Entry
2.Lobby
3.Retail

Space

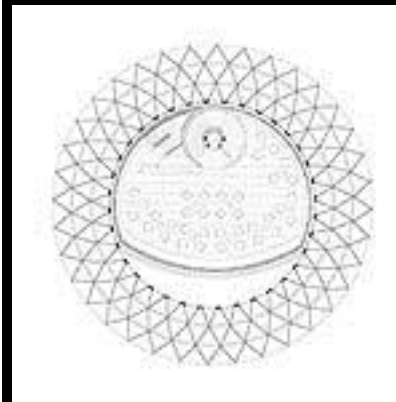
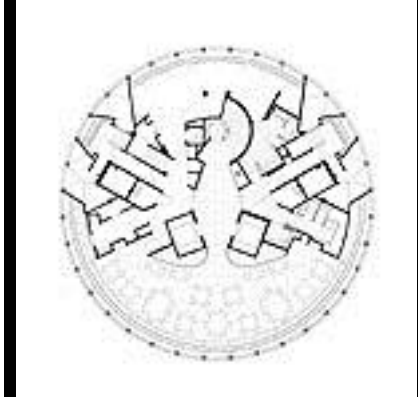
21th floor



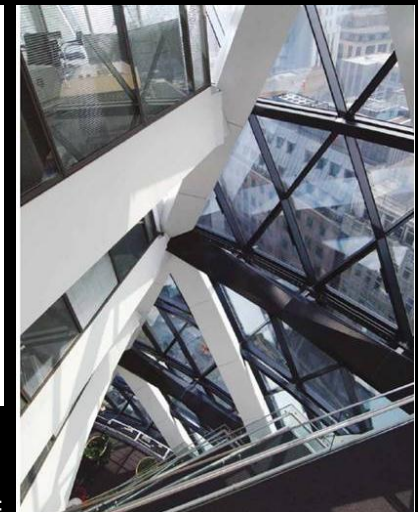
33th floor



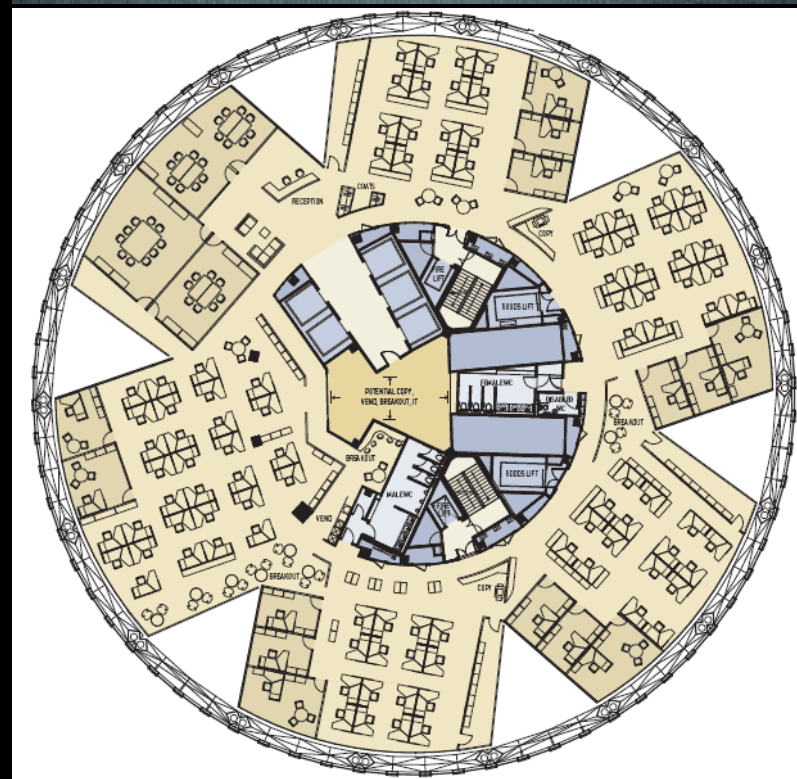
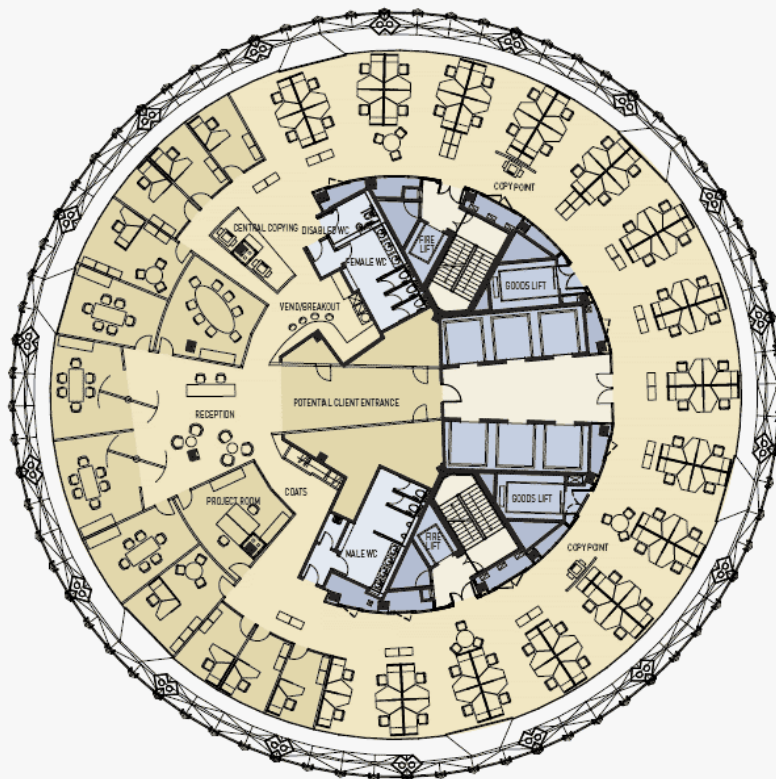
39th floor



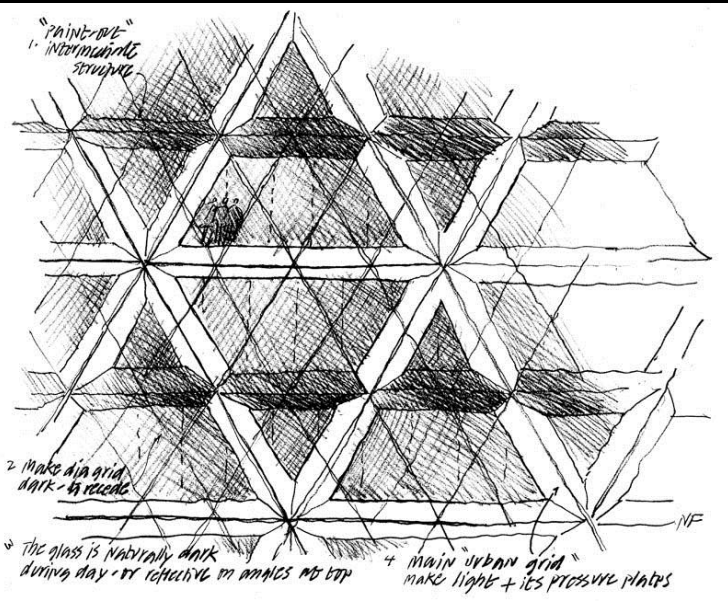
40th floor



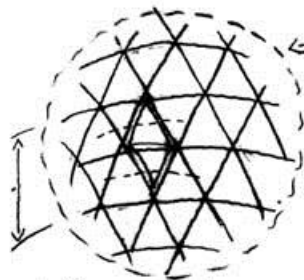
- 每層平面轉5度
- 因應英國消防法規，中庭天井高度以6層樓為一組
- 因外層的桁架網搭配中心柱，主要使用空間可無落柱



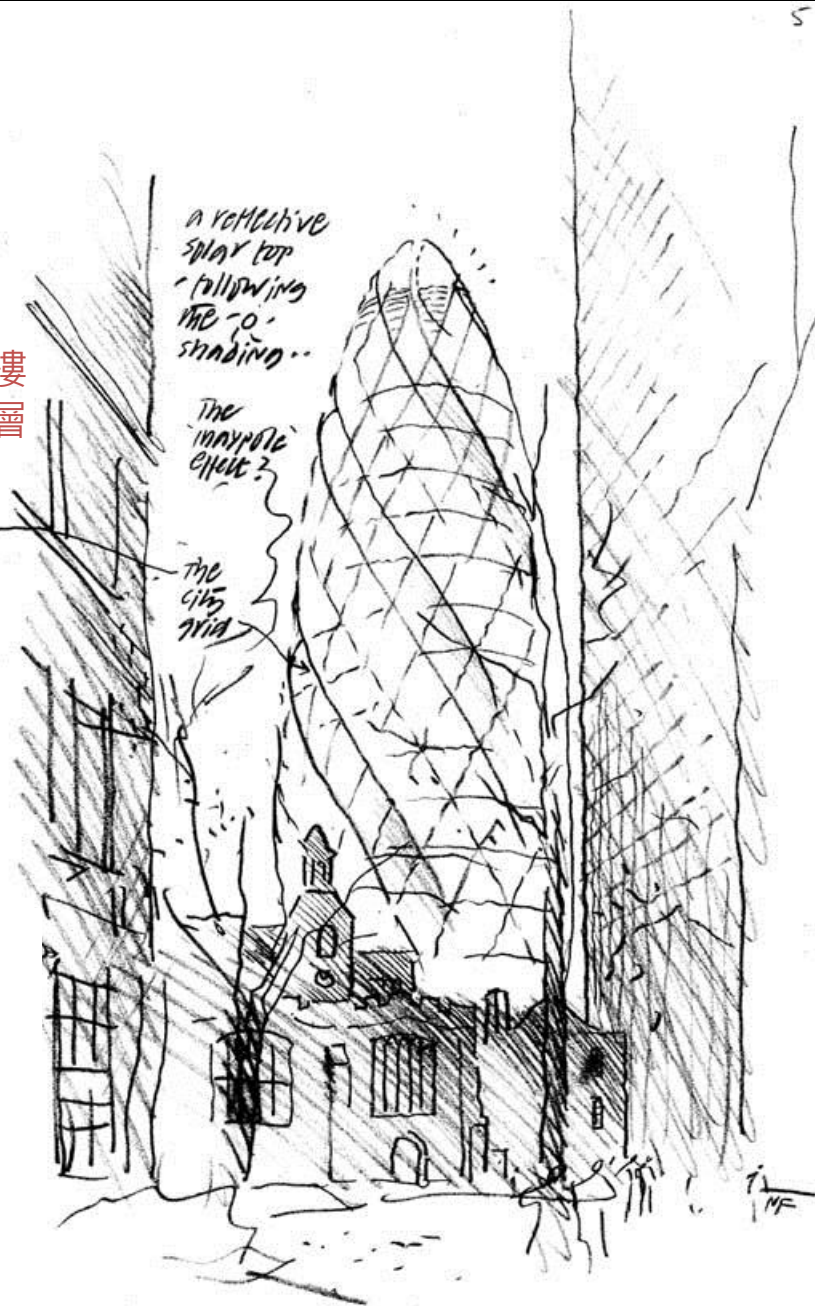
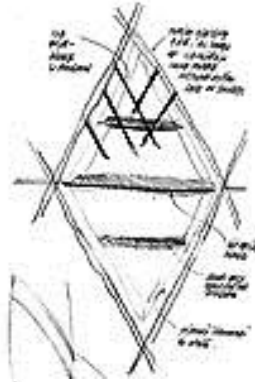
Diagrid



建造期間以2層樓
為一個週期，4層
樓組成一菱形



The "city grid" is
really a 4-storey
increment, visually



The "city within a city" has
always been full of surprises!

City in the city!

Strategies

6條深色螺旋線，於內是導引氣流的通風內庭；於外則有吸熱、降低陽光直接照射的作用。



Strategies

Curtain wall – 辦公區 & 內庭區

- Shape 梭形
- Double-glazed ventilated skin
- Operable windows
- Ventilative gas



- Dark glass



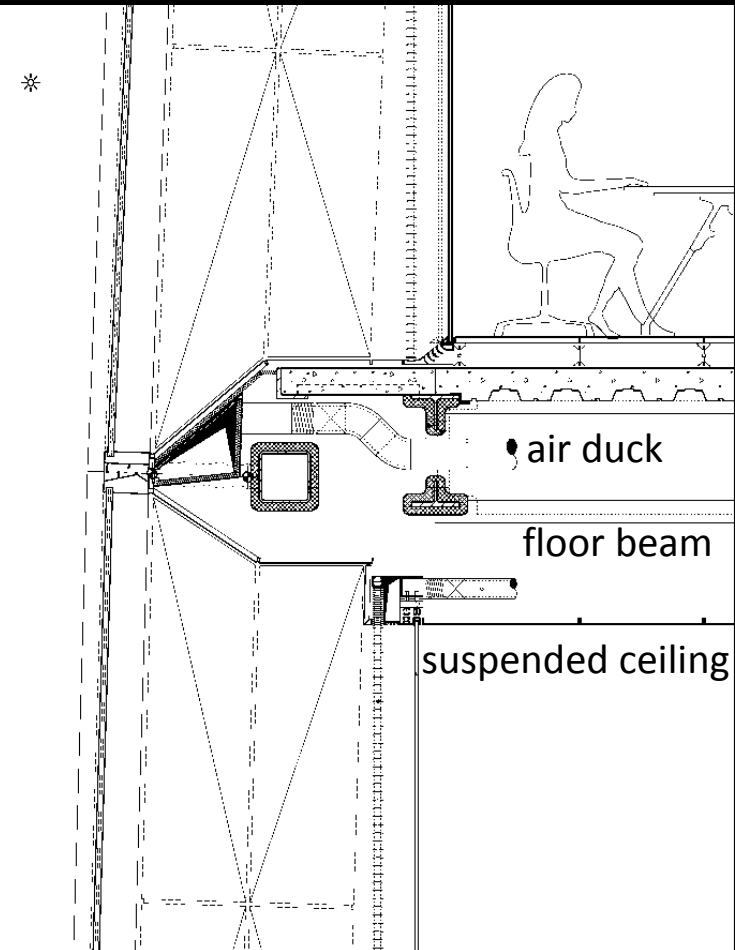
- 弧形上的開窗，將被導引開來的風引入室內

Strategies

Curtain wall



Figure 20.22 Cooling strategy (summer) for Swiss Re Tower



Strategies

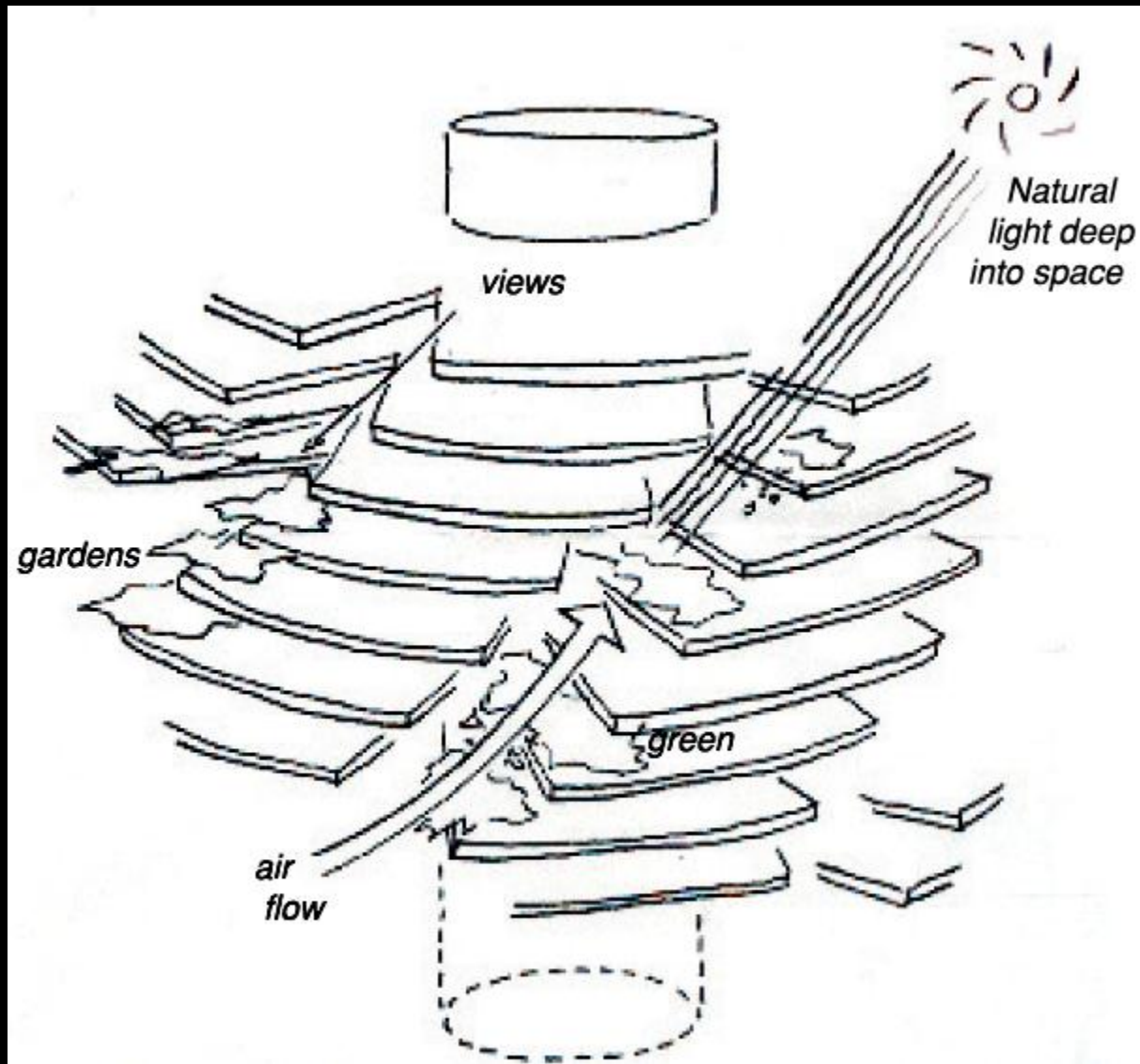
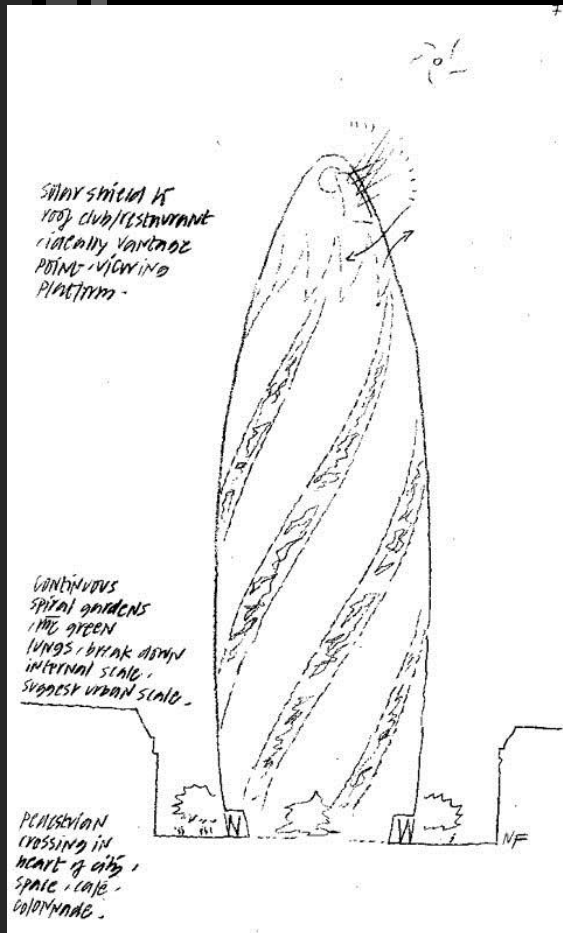
Curtain wall



Strategies

Natural Daylight

- The light wells





Strategies

Systems

- primary fuel is gas
- low energy fixtures
- utilizes a de-centralized HVAC for floor-by-floor needs

Transportation

- public transport
- bike spaces within basement

Materials

- Constructed of materials that can be easily recycled – steel & glass
- Total weight of steel (from Arup Xsteel model): 8,358 tonnes
 - of which: 29% is in the diagrid
 - 24% core columns
 - 47% beams



Analysis

about Sustainability

- 針對《The Philosophy of Sustainable Design》一書中永續設計之觀念 (Sustainable Design is a design philosophy that seeks to maximize the quality of the built environment, while minimizing or eliminating impact to the natural environment.), 及對未來建築The Living Building 的展望，以此為前提來分析Swiss Re Tower。
- 從辦公建築的角度出發，歸納出
 - 空間安排 --- 商辦空間量大
 - 內庭花園空間 --- 人與自然、環境間的互動
 - 科技運用 --- 建築物愈高、量愈大，維持運作所需能源愈多
 - 地域性 --- 考慮氣候、地理人文等條件因地制宜的設計等四個項目

Analysis

		空間安排	內庭、花園	科技運用	地域性
Sustainable Design	提升建築環境品質	●	●	●	
	降低自然環境衝擊		●	●	
The Living Building	彈性適應性	●	●	●	
	與自然之連結			●	
	降低能源使用	●	●	●	
	提升人類福祉	●	●	●	
	自然美感				

Analysis

設計策略

主動	被動				
監控系統	自然通風	自然採光	隔熱、儲熱	綠化	再生能源
	■ 內庭通風 ■ 可開啟之窗戶	內庭採光	帷幕牆		X

舒適度

心理			生理	
視覺	聽覺	個人化	溫、濕度	通風
■ 透明性 ■ 內庭空間	全為室內空間		■ 監測系統 ■ 雙層帷幕	內庭通風

Conclusion

about Sustainability

- Swiss Re Tower 是倫敦第一棟生態高樓，其用的策略概念上其實很簡單，藉由空間安排，大大減少相較於傳統高樓50%的耗能。不過本大樓並未自行產生再生能源，仍處於耗能階段。
- 透過6條內庭通道，除了導引氣流幫助空氣流通，更將舒適的採光引入，使Swiss Re Tower除了中心服務核外，個部均能感受自然採光。
- 結構上，外部桁架網格接點採工廠預鑄，降低工程時數。且外部桁架搭配服務核的垂直傳力結構，使內部使用空間無落柱，提高空間品質及彈性。
- 即便Swiss Re Tower的外觀呈梭形，藉由三角形的分割，不僅使結構穩定，且外部的5500塊玻璃皆為平面，唯一的曲面玻璃為頂部的len，降低工程難度。



Reference

- Norman Foster: Works 5/David Jenkins, 2009
- Foster+Partners
<http://www.fosterandpartners.com/Practice/Default.aspx>
- ARCHITECTUREWEEK
http://www.architectureweek.com/2005/0608/design_2-3.html
- <http://www.archinomy.com/case-studies/669/30-st-mary-axe-the-gherkin-london>