

30 ST. MARY AXE A SUSTAINABLE LANDMARK IN LONDON



Photo: Foster+Partners

- Official Name: 30 St. Mary Axe¹
- Alternative Names: Swiss Re Tower, The Gherkin¹
- Location: London, United Kingdom¹
- Usage: Office¹
- Height (Architectural): 179.80m¹
- Number of Stories: 41 Above, 1 Below Ground¹
- Construction: 2000-2004¹
- Design Architect: Foster + Partners¹
- Structural Engineer: Ove Arup & Partners¹
- Main Contractor: Skanska AS¹
- Structural System: Trussed Tube³
- Structural Material: Steel¹
- Elevators: 24¹
- Roof System: Dome²

1) CTBUH, 2) Emporis, 3) Yüksek Binalar

• HISTORY OF THE SITE

The site was previously occupied by the Baltic Exchange, which severely damaged by a bombing in 1992. There was a tendency to restore the old building, but as the damage was severe, it was decided for a new commercial building.⁴

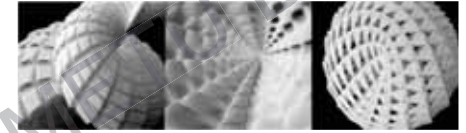


The Baltic Exchange building before and after the bombing

Left Photo: www.habitables.co.uk - Right Photo: www.no44tribution.blogspot.com

• THE DESIGN PROCESS

The Foster + Partners Specialist Modeling Group's (SMG) job is to help the architects to make virtual models of the projects by the use of CAD (computer aided design) tools. They have used parametric design in order to have a variety of geometry features and enable them to explore a huge range of design options in a very short period of time.⁵

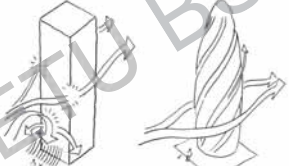


Some Virtual parametric Models of the architects' ideas done by the SMG

Photo: courtesy Brady Peters

• THE DESIGN PROCESS

The digital simulation model has shown that the conical shape responds better to air currents than a square one.⁵ Moreover, conical shape decreases the wind turbulence, and creates wind pressure to assist the natural ventilation.⁴ It also creates a small footprint to maximize the public use.⁶

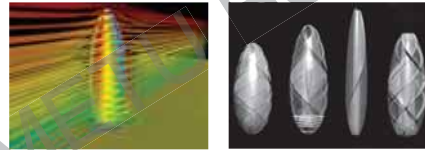


The wind effect on square shape, or cylindrical shape tower

Photo: www.architectureweek.com

• THE DESIGN PROCESS

By use of the computer model and simulation of wind currents around the tower, architects have tried to reach to the exact shape. The advantage of using parametric modeling, has helped them to decide about shape of building, as it provides a large variety of shapes to be considered.



The computer simulation of wind blow effect on the tower

Trying different shapes by use of parametric model

Photo: www.architectureweek.com

• THE DESIGN PROCESS

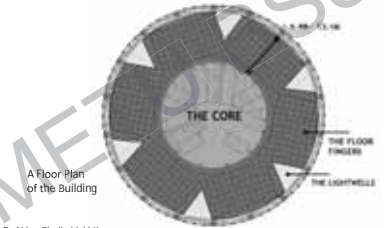
Experience of creating the parametric model of the tower: some alternatives (by Abbas Riazibeidokhti)



Parametric Model Created by Abbas Riazibeidokhti

• THE DESIGN PROCESS

A radial floor plan with six fingers spreading out from a central core has been used in the building. This core contains elevators and other services.⁷ The core to perimeter lengths differ in different floors from 6.4m to 13.1m.⁸

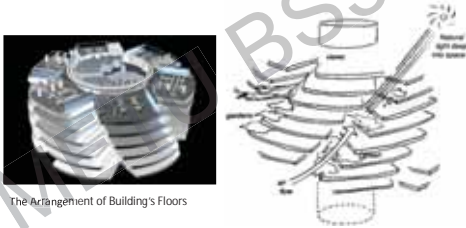


A Floor Plan of the Building

Drawn By Abbas Riazibeidokhti

• THE DESIGN PROCESS

The floors' fingers create lightwells for light penetration and natural ventilation.⁴ Each floor rotates 5 degrees from the one below it.⁸ This rotation simplifies the air movement and let the light to come deep into the building.

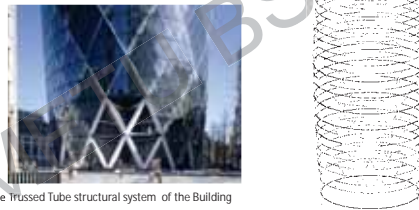


The Arrangement of Building's Floors

Left Photo: Yuming Shen, Green Design & the City Buildings - Right Photo: www.aviewonline.com

• THE STRUCTURAL SYSTEM

The 30 St. Mary Axe tower is an example of Trussed Tube structural system.³ In other words, the main weight is carried by the outer diagrid (diagonal grid) structure.

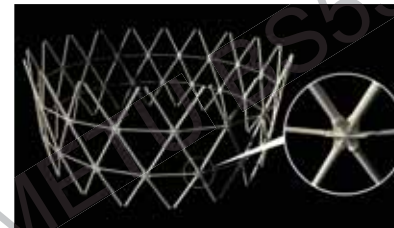


The Trussed Tube structural system of the Building

Left Photo: Foster+Partners - Right Photo: Dominic Munro, MA MStructE, Ove Arup and Partners, London

• THE STRUCTURAL SYSTEM

Diagrid is a structural system made of triangular structures and horizontal rings, which is a suitable system for high rise buildings.⁹

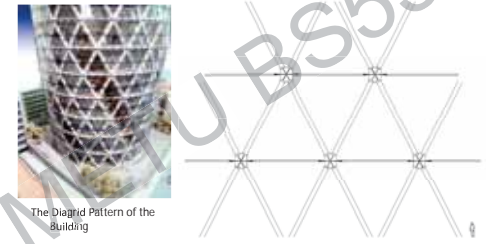


The Diagrid System Used in the Gherkin Tower, and its Joints

Drawn By Abbas Riazibeidokhti

• THE STRUCTURAL SYSTEM

The diagrid structural system has been widely used for recent tall buildings due to its structural efficiency and aesthetic potentials.¹⁰



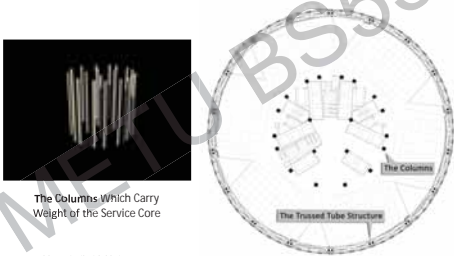
The Diagrid Pattern of the Building

Left Photo: Ian McCain, Diagrid: Structural Efficiency & Increasing Popularity

Drawn By Abbas Riazibeidokhti

• THE STRUCTURAL SYSTEM

More than the outer diagrid structure, there also exist a set of columns which mainly carry the weight of central service core, containing elevators and other services.¹¹



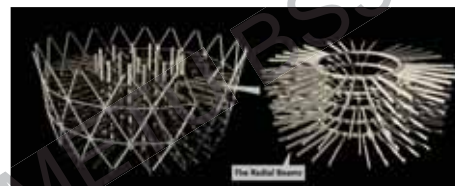
The Columns Which Carry Weight of the Service Core

The Trussed Tube Structure

Drawn By Abbas Riazibeidokhti

• THE STRUCTURAL SYSTEM

Each floor is circular and contains an inner ring attached to the columns, and an outer ring attached to the trussed tube structure. These rings are attached to each other by use of radial beams.



The Radial Beams Attaching the Columns to the Diagrid Structure

Drawn By Abbas Riazibeidokhti

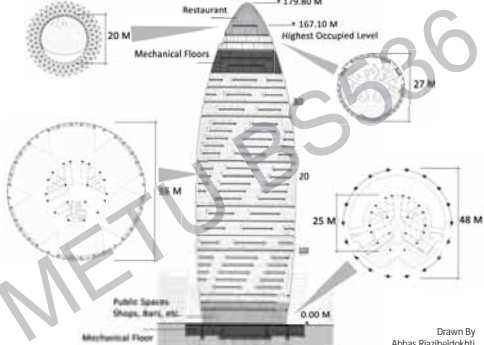
• THE STRUCTURAL SYSTEM

The radial beams support steel decking based composite floor slabs. The size of the core is constant, but the outer floors vary in diameter at each level.



The Radial Beams Support the Floor Slabs
Drawn by Abbas Riazibeidokhti

Right Photo: Bill Fedun, 30 St. Mary Axe by Foster and Partners, 2005



Drawn By Abbas Riazibeidokhti



At the top part of the tower, under the dome of building, there exists a restaurant which provides a 360 degrees view of London.



Drawn By Abbas Riazibekhtli

Photos: Bill Fedun, 30 St. Mary Axe by Foster and Partners, 2005

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