

Title: **Millenium Tower 150-story (Japan)**

Author: Keizo Shimizu

Subjects: Architectural/Design
Building Case Study

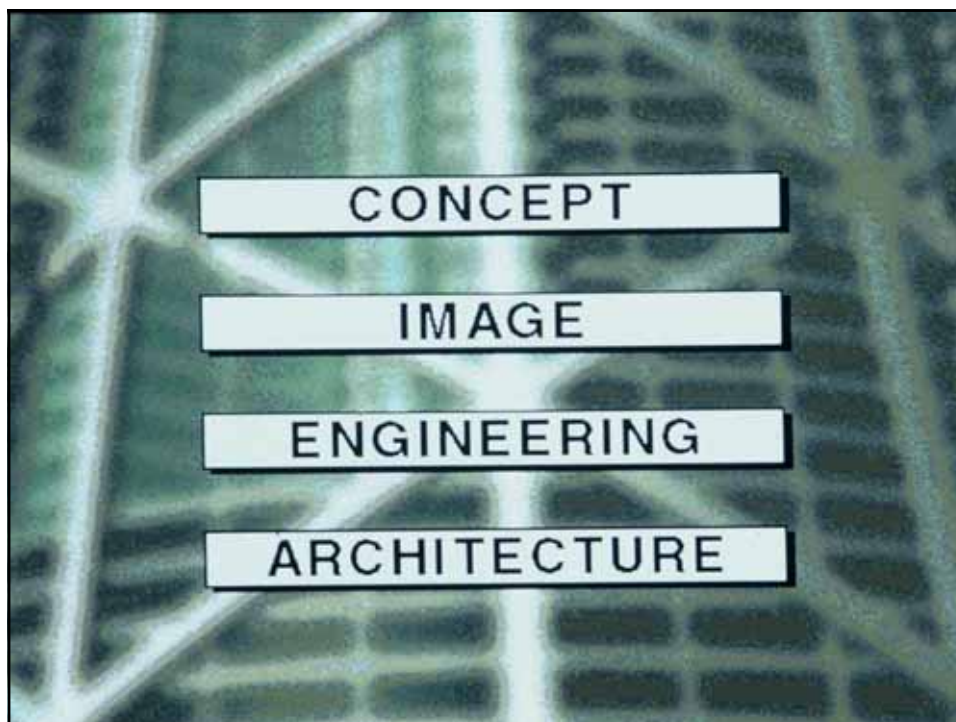
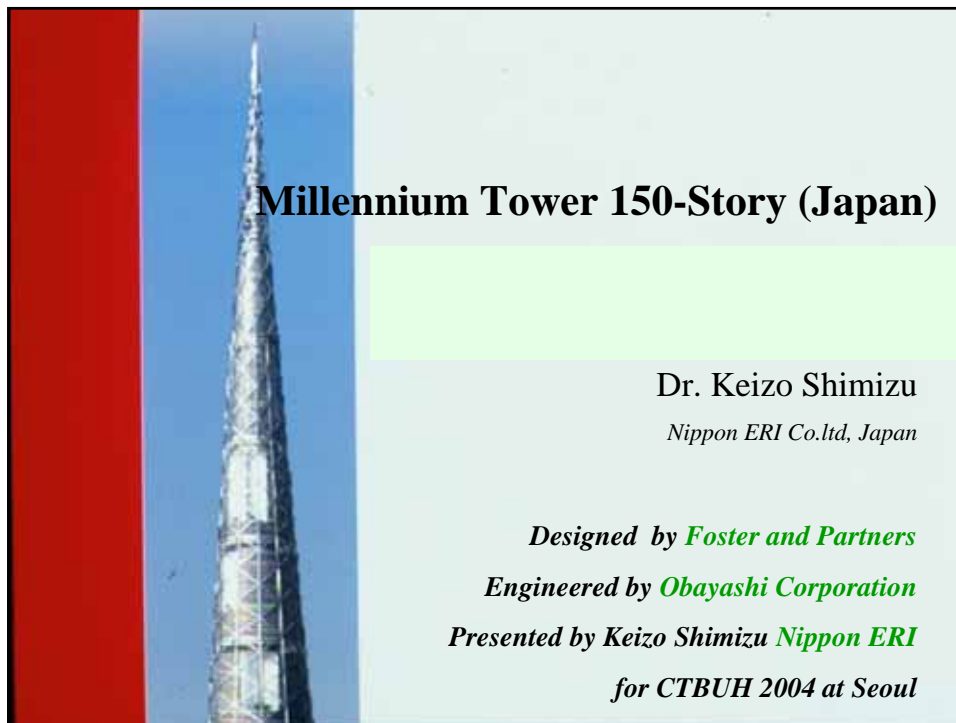
Keyword: Urban Design

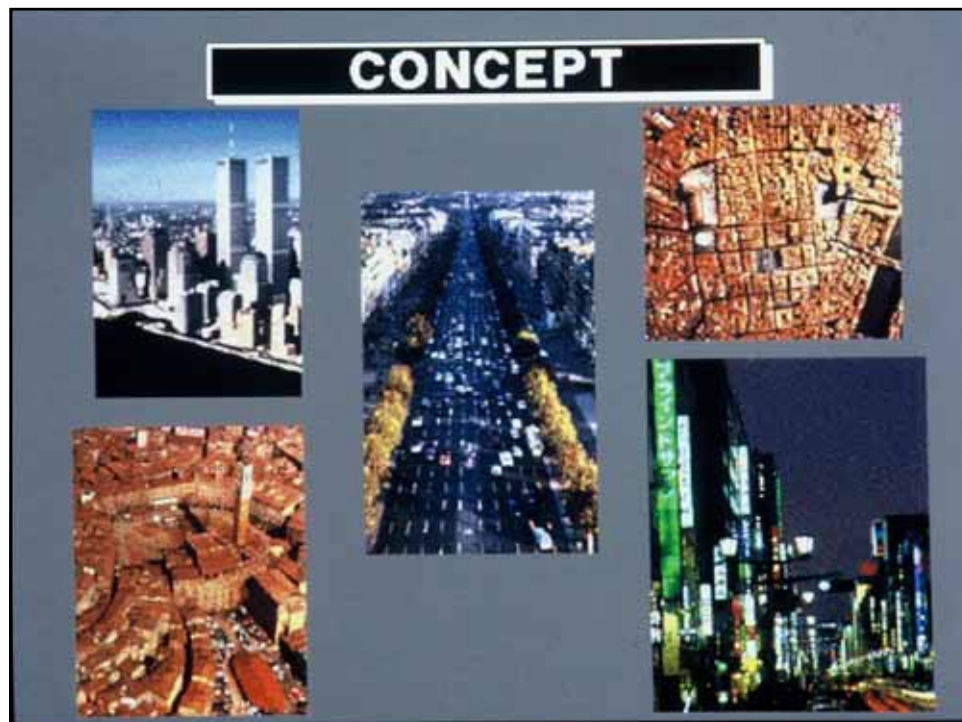
Publication Date: 2004

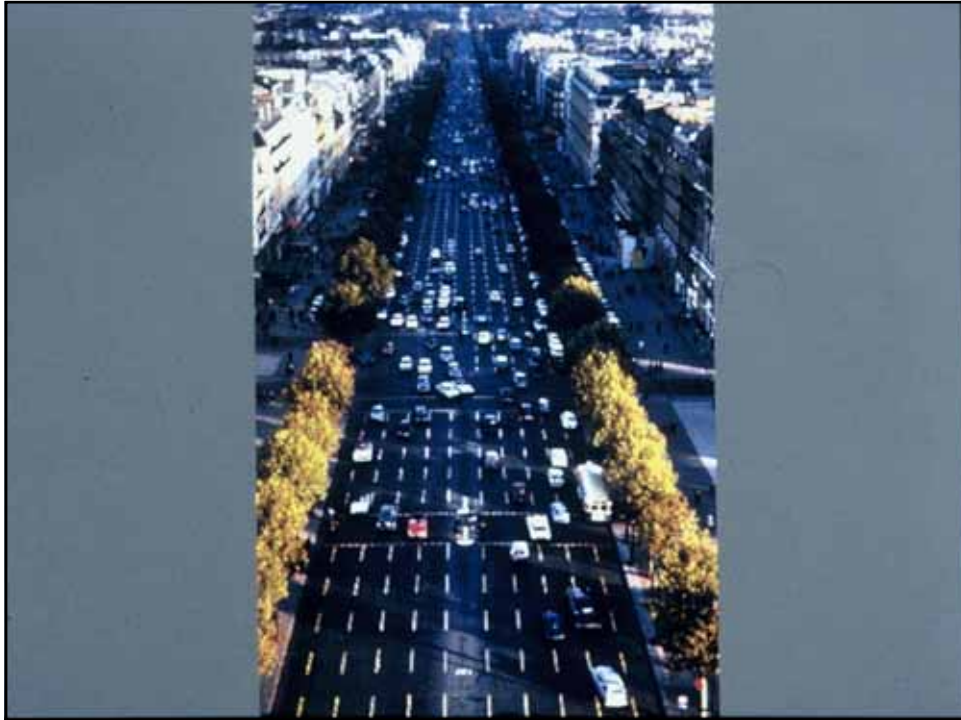
Original Publication: CTBUH 2004 Seoul Conference

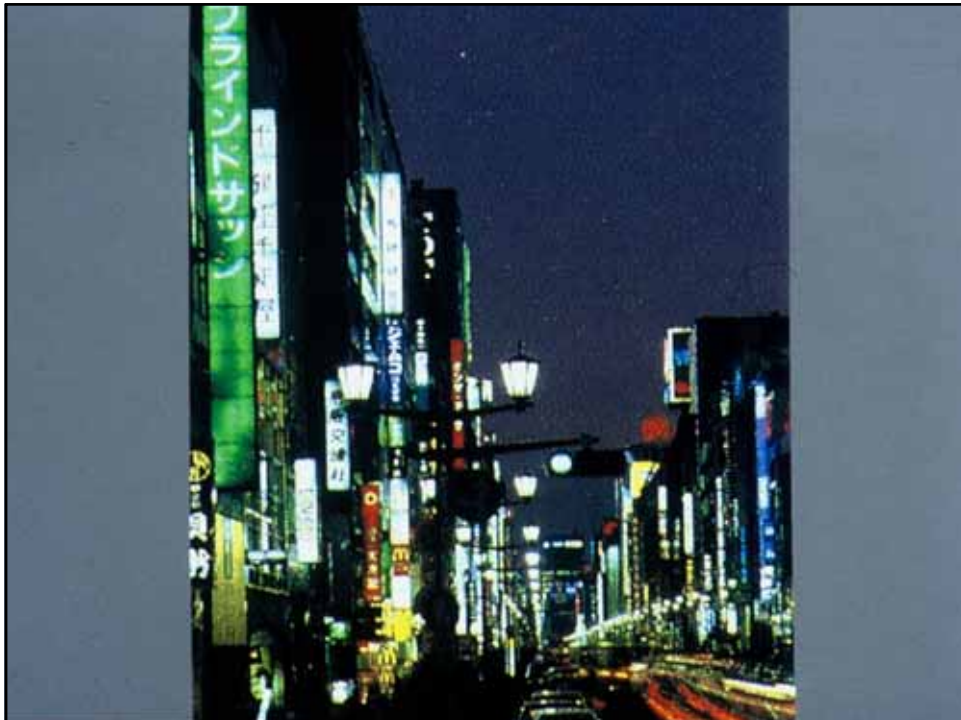
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2. Journal paper
3. Conference proceeding
4. Unpublished conference paper
5. Magazine article
6. Unpublished









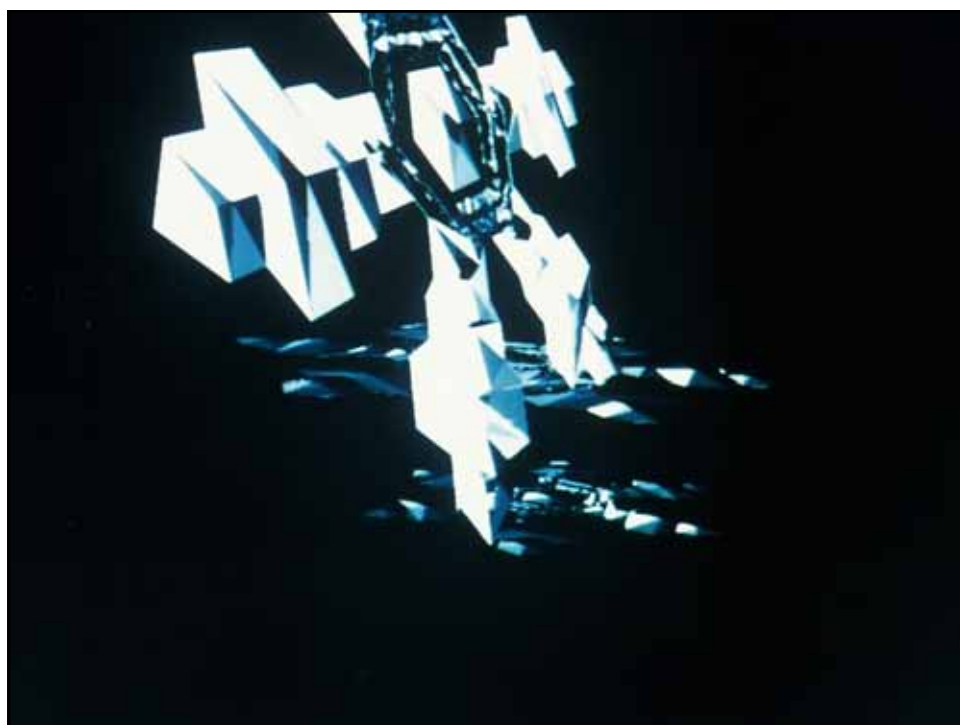
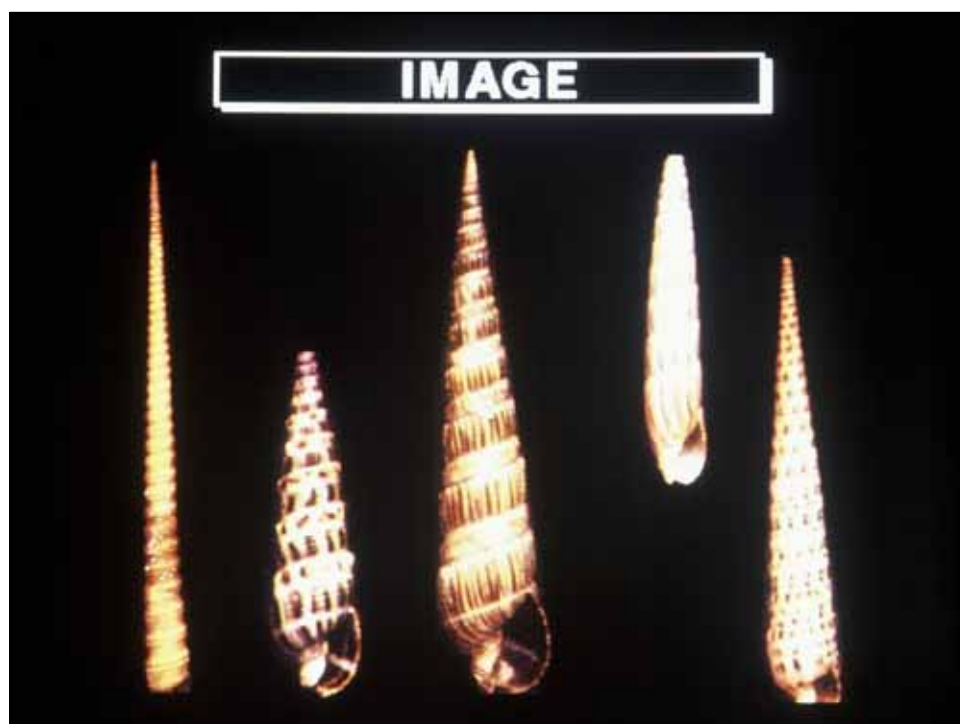


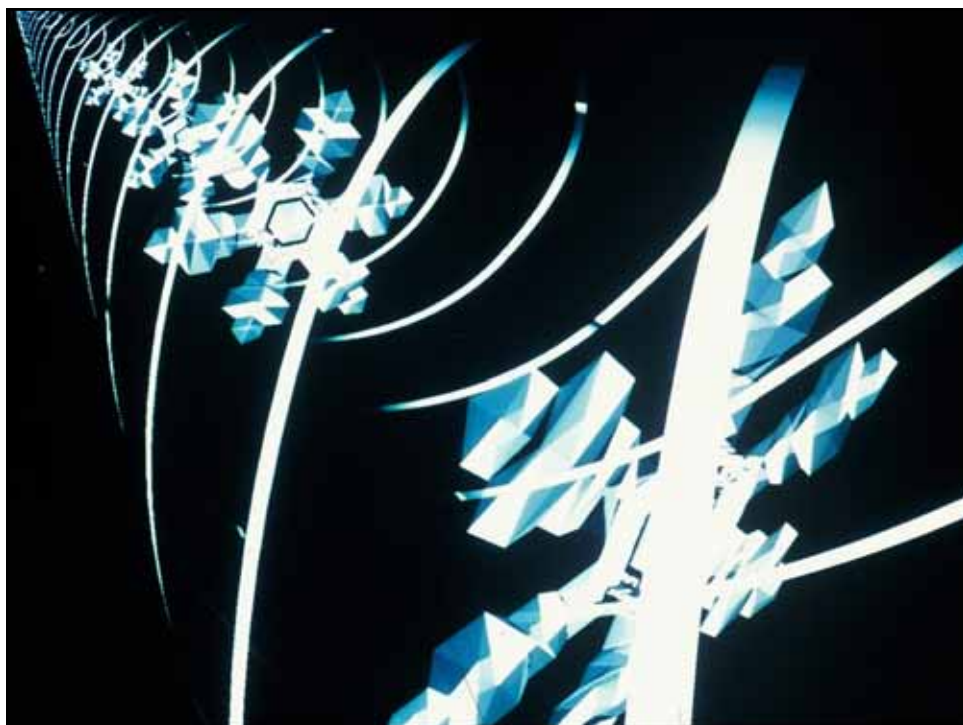
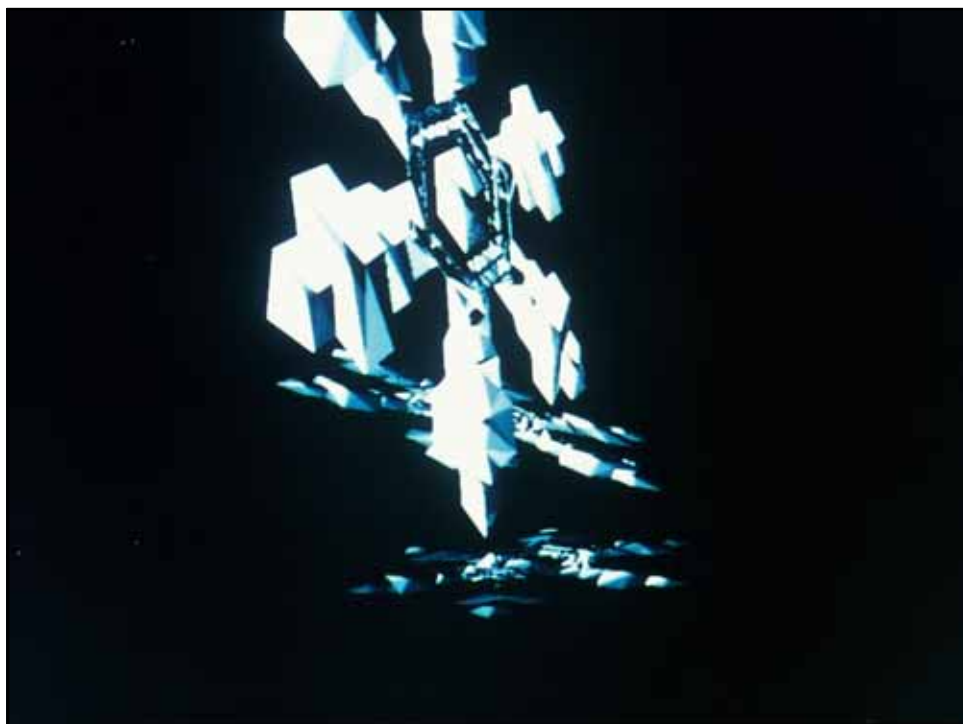
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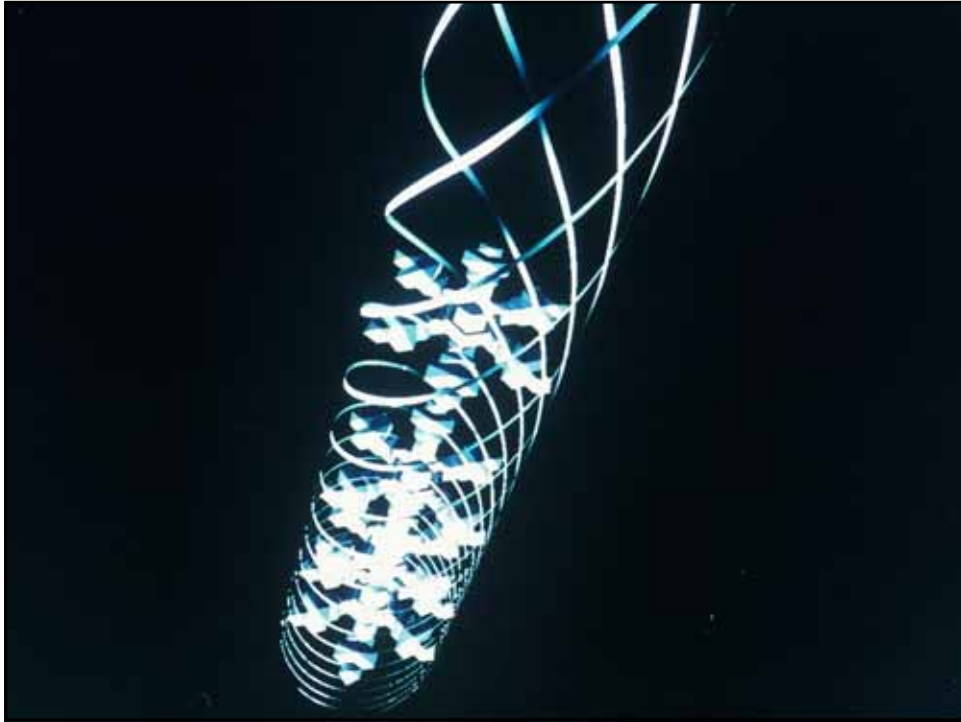


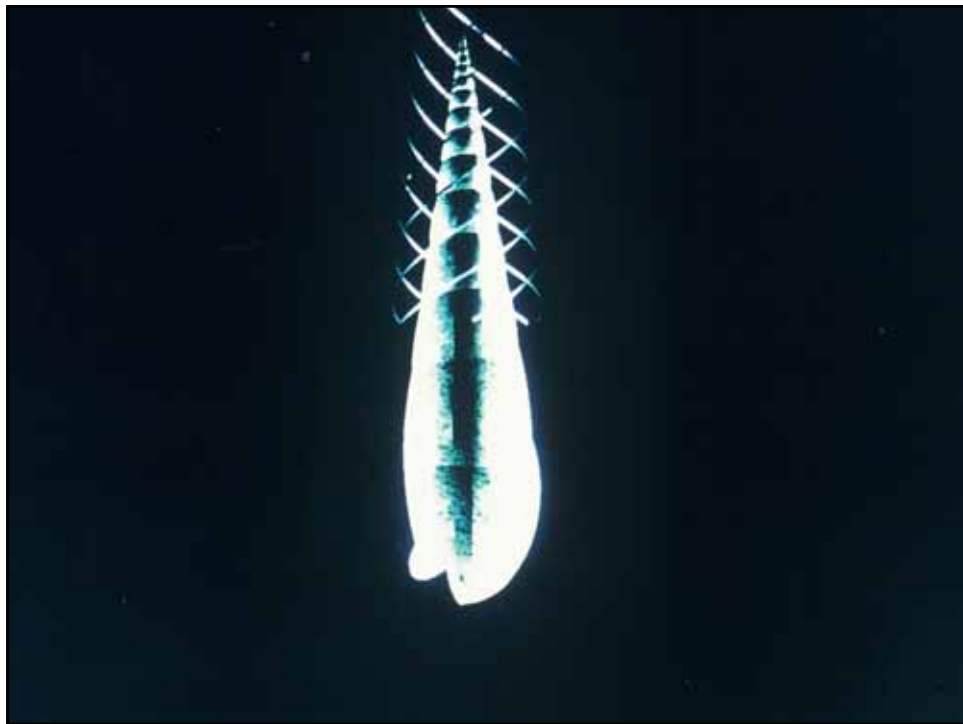
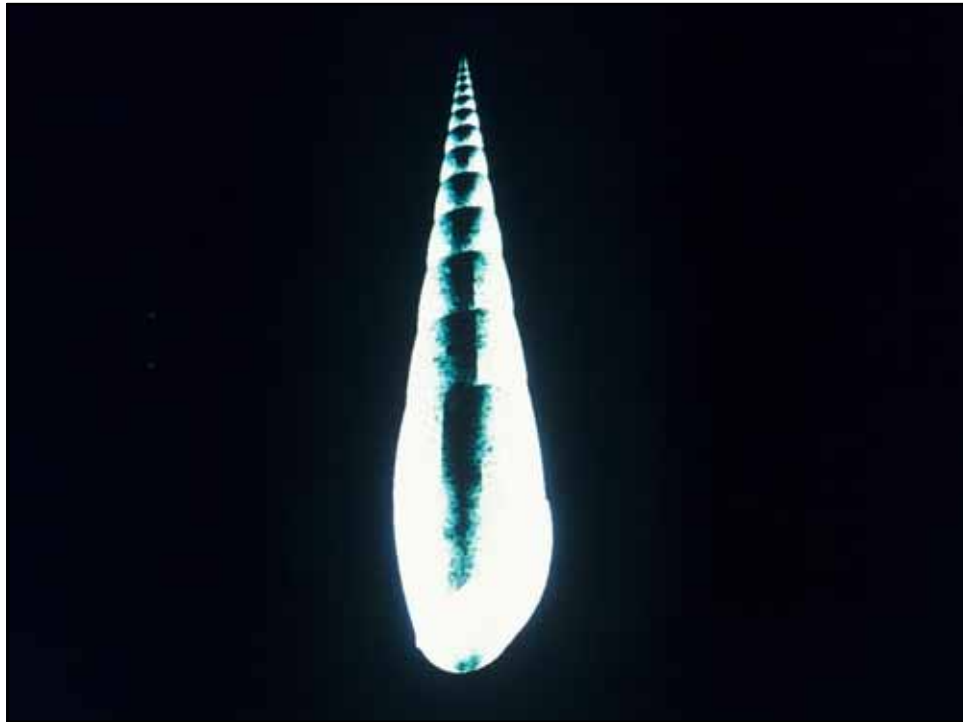
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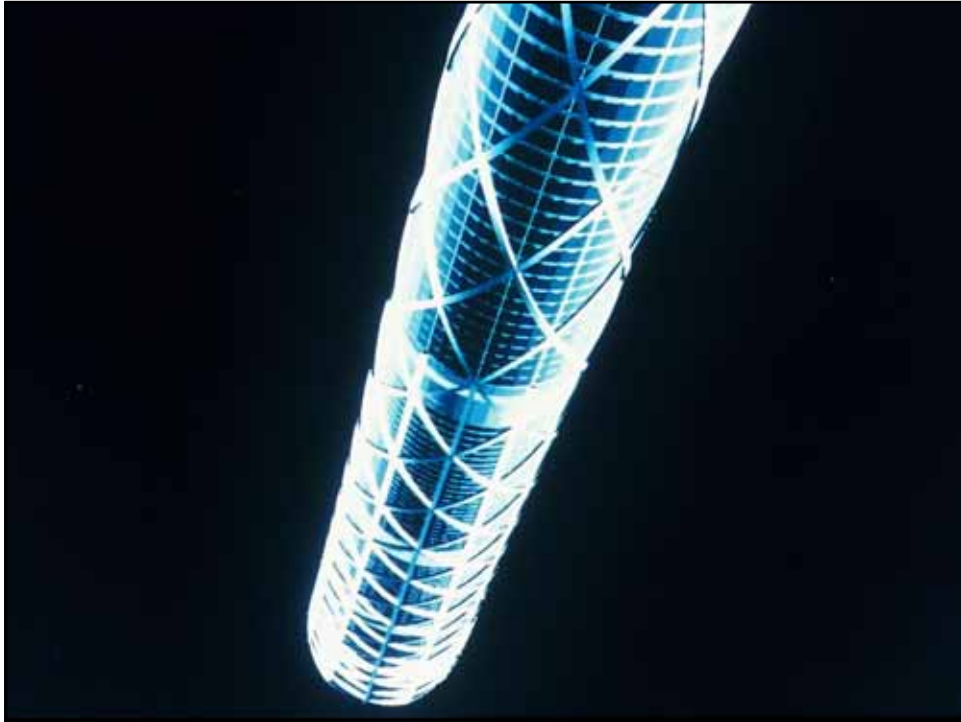


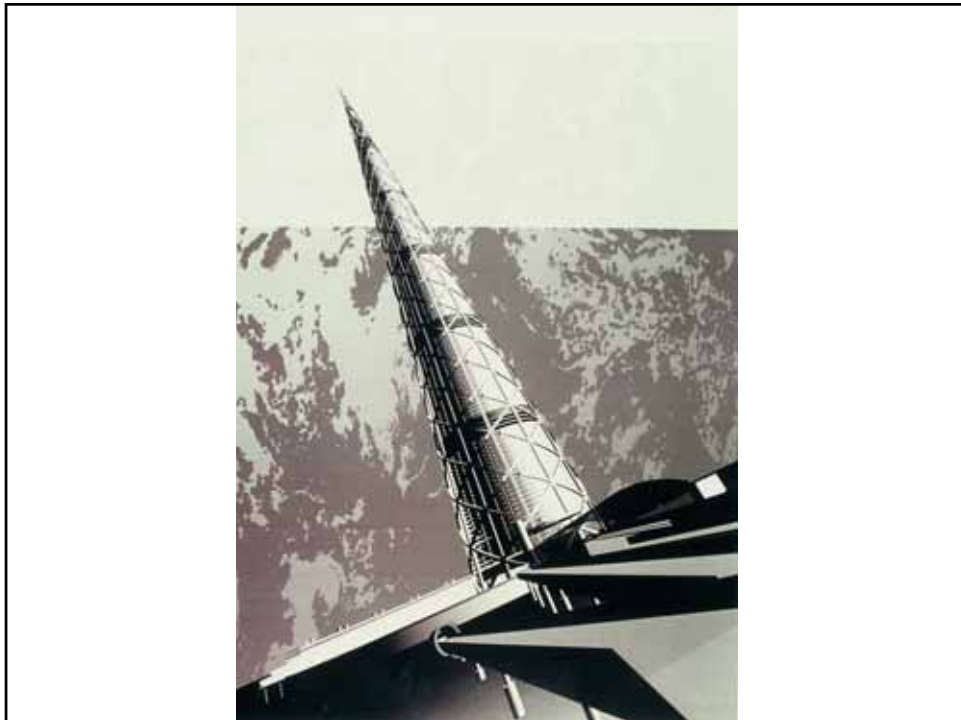
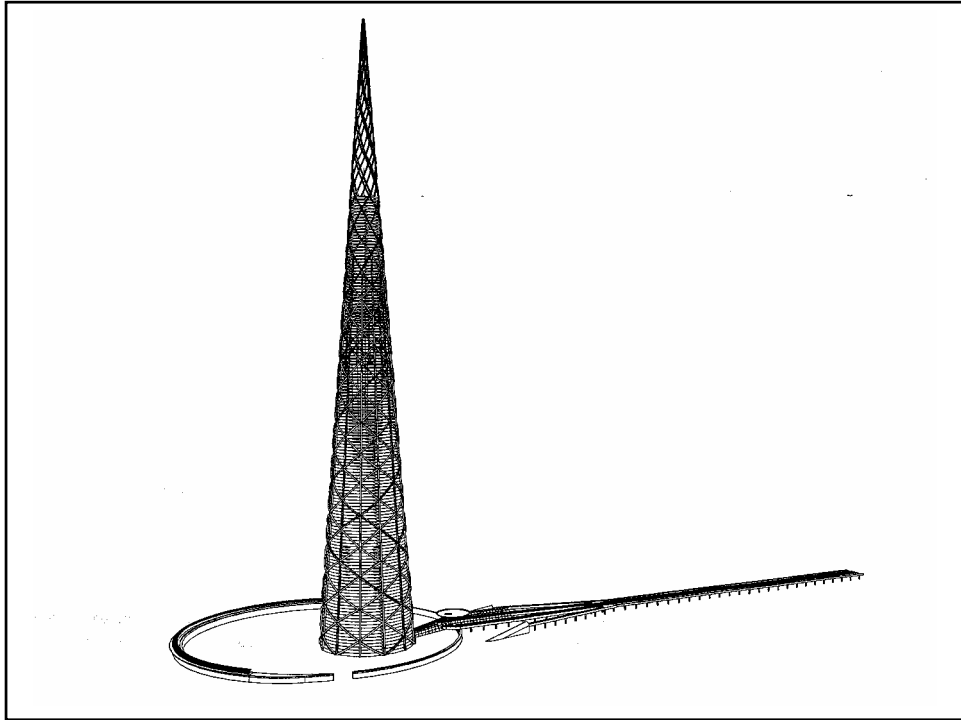


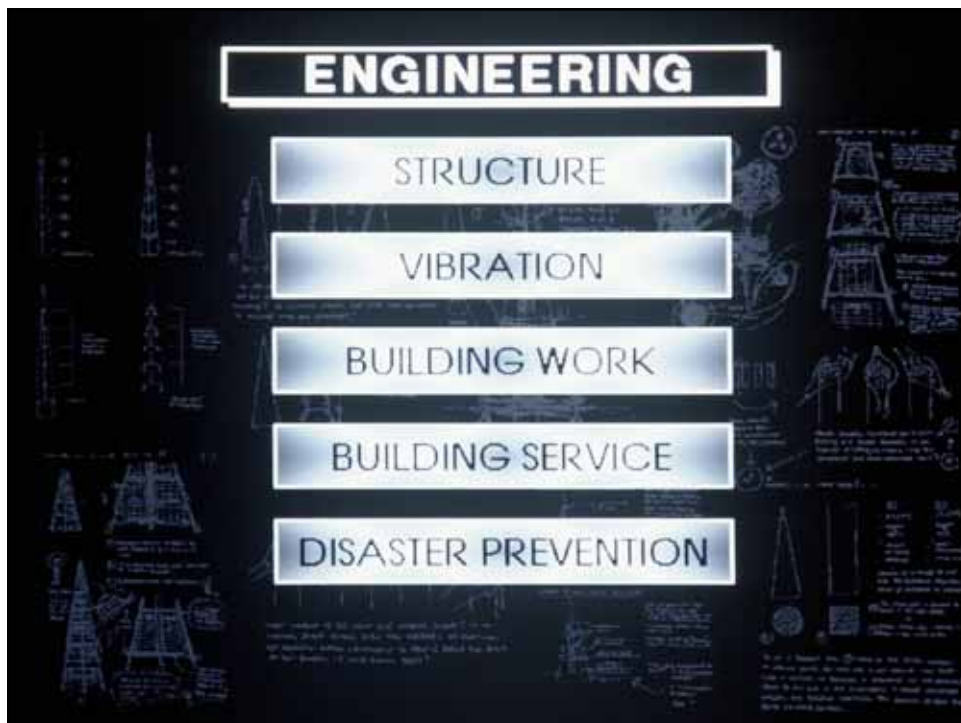


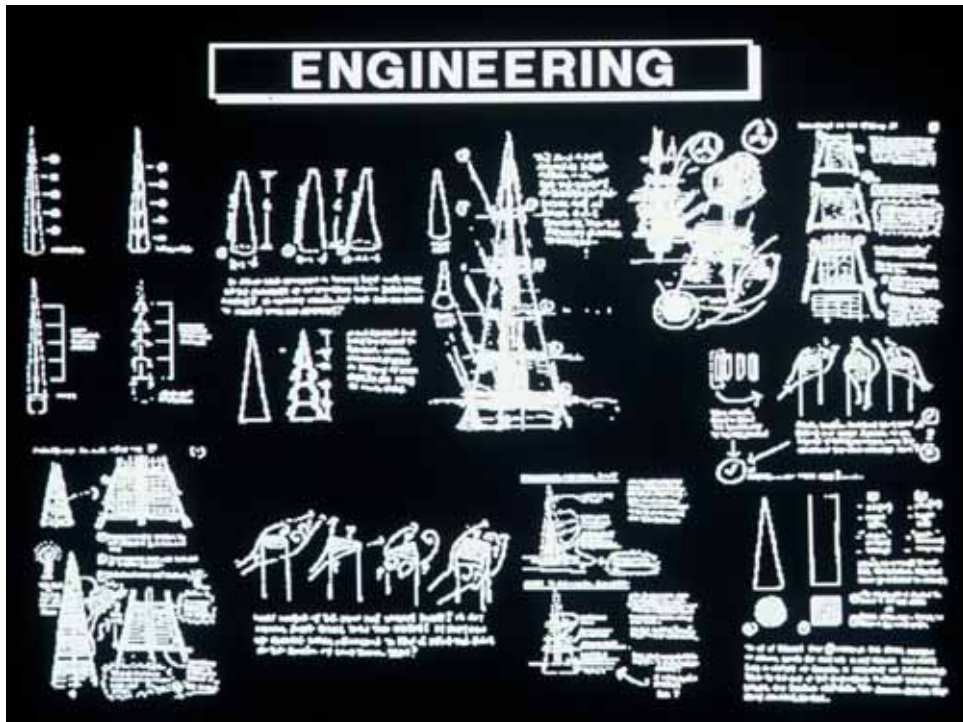
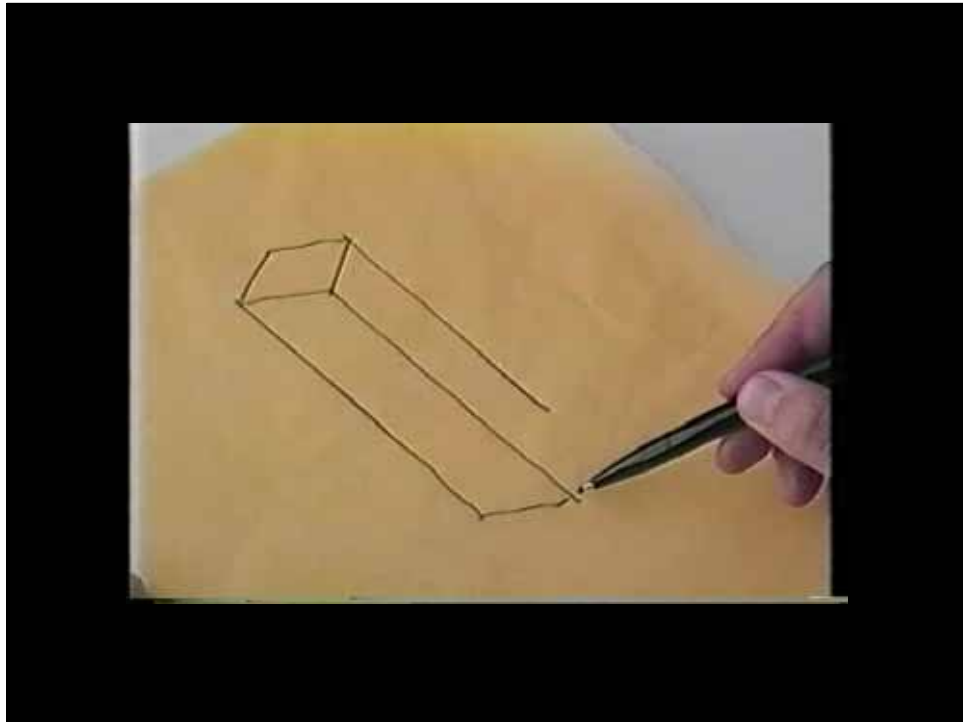












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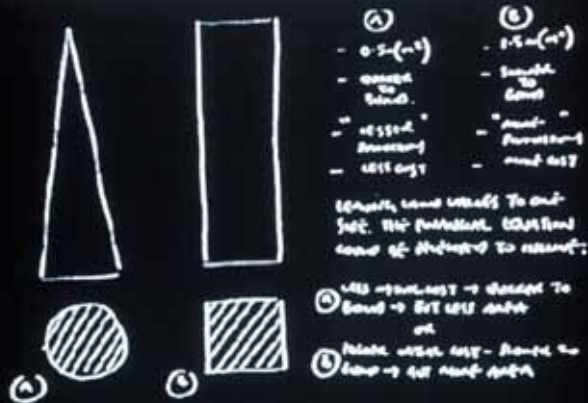


WHAT HAPPENS AS THE WIND TUNNEL SHAPES? IS ANY
OVERALL SHAPE BETTER THAN THE OTHERS? BY STUDYING
WE CAN GET SOME INFORMATION TO HELP US DESIGN THE FORM
OF THE BUILDING → WIND TUNNEL TESTS?

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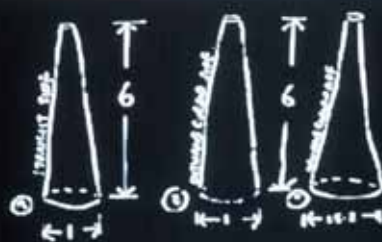


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TO US IT SUGGESTS THAT (C) MUST BE THE CORRECT ANSWER
 THE OTHER THREE: BUT THEY ARE ALL THE SAME IS HOW MANY
 WITH A WEIGHT OF 1011 GPT. IS DIFFERENT AND THE ANSWER
 IS 1011 GPT. AT THE CORRECTED. TO AVOID THE PROBLEM
 INSTEAD AND THEREFORE MINIMIZE THE CORRECT ANSWER THIS
 IS THE CORRECT ANSWER.

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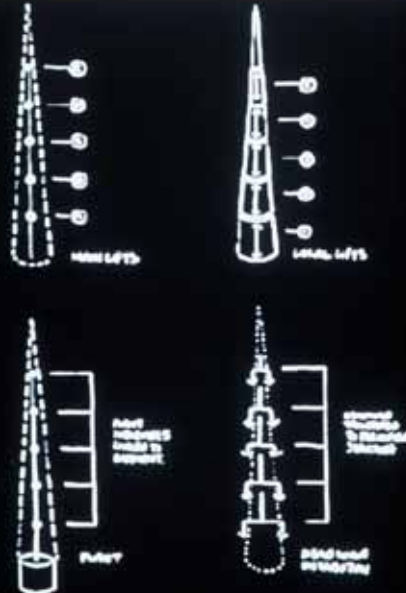


TO FIND THE CORRECT ANSWER IN THESE THREE CASES, WE
 MUST FIND THE CORRECT ANSWER. THE CORRECT ANSWER IS
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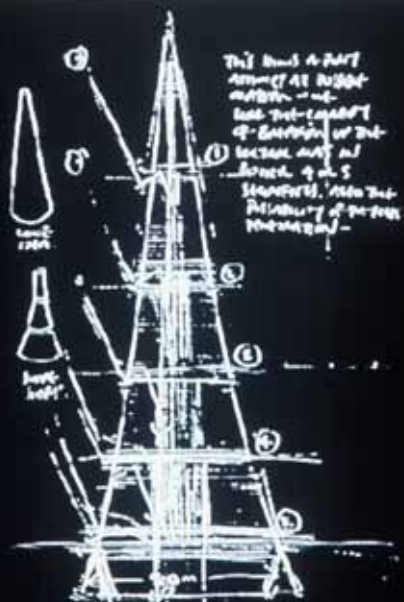


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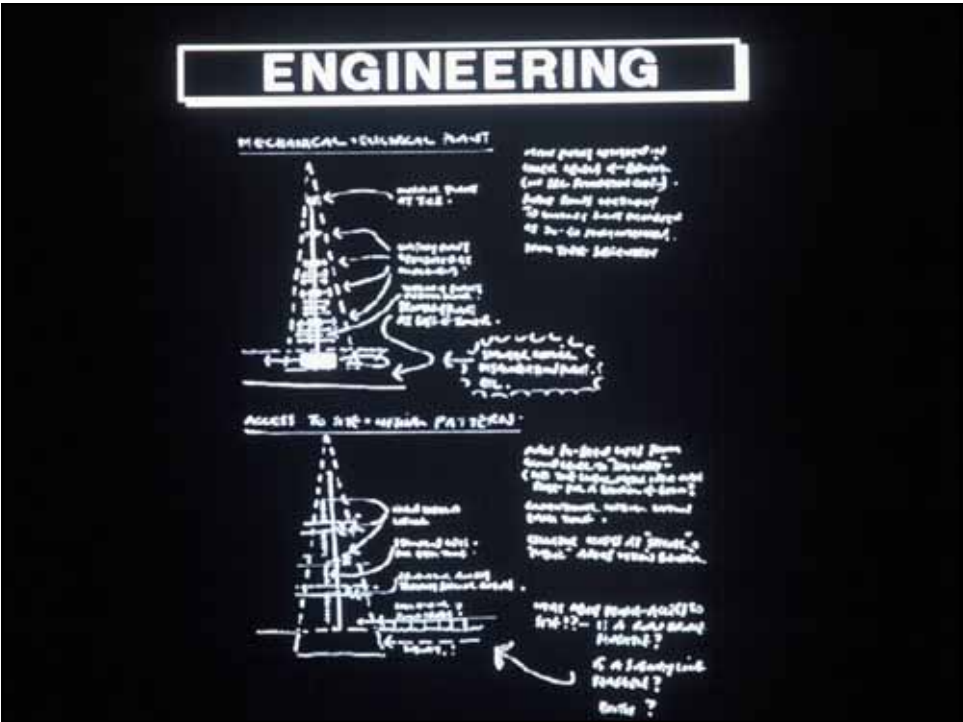
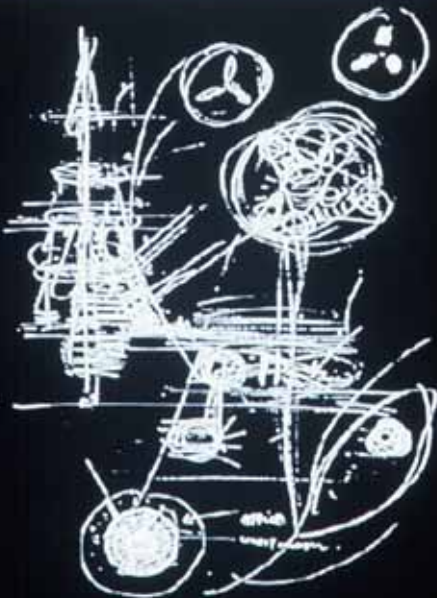
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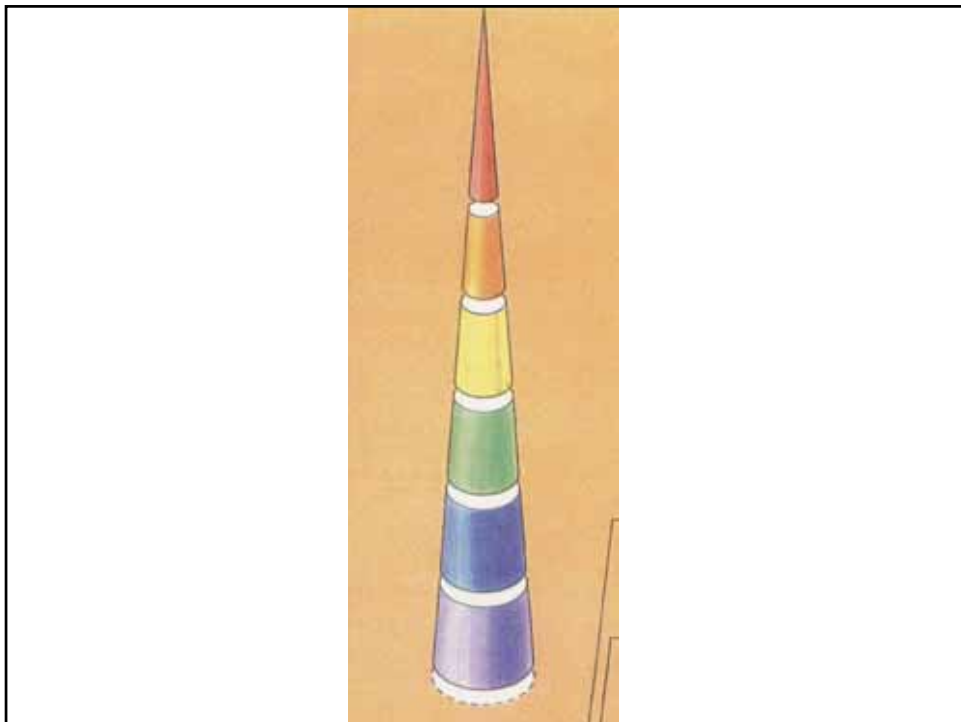


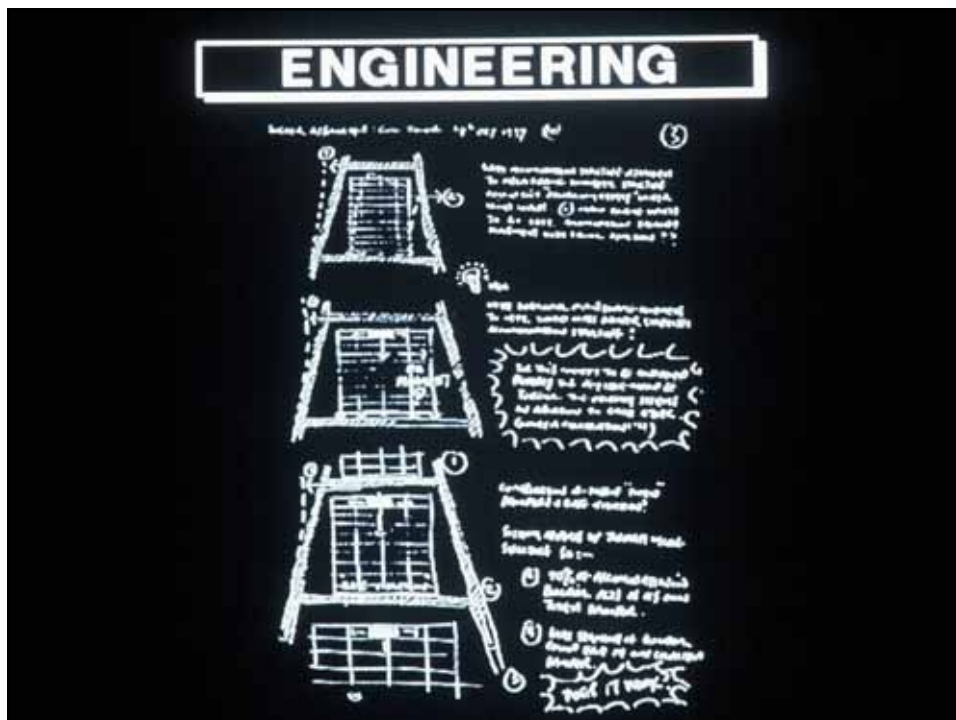
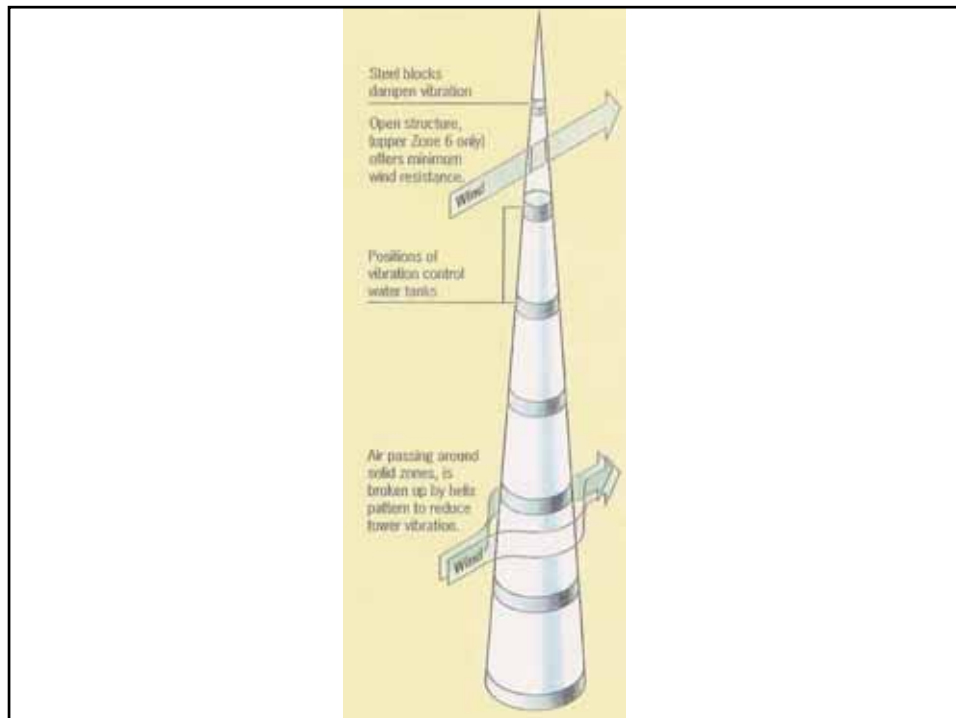
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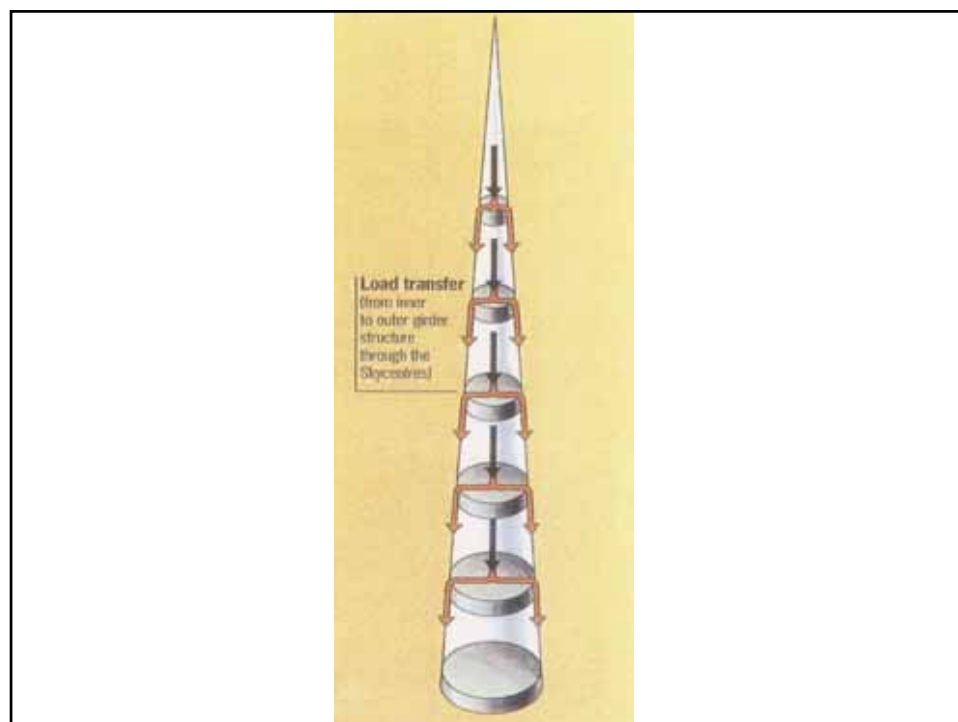
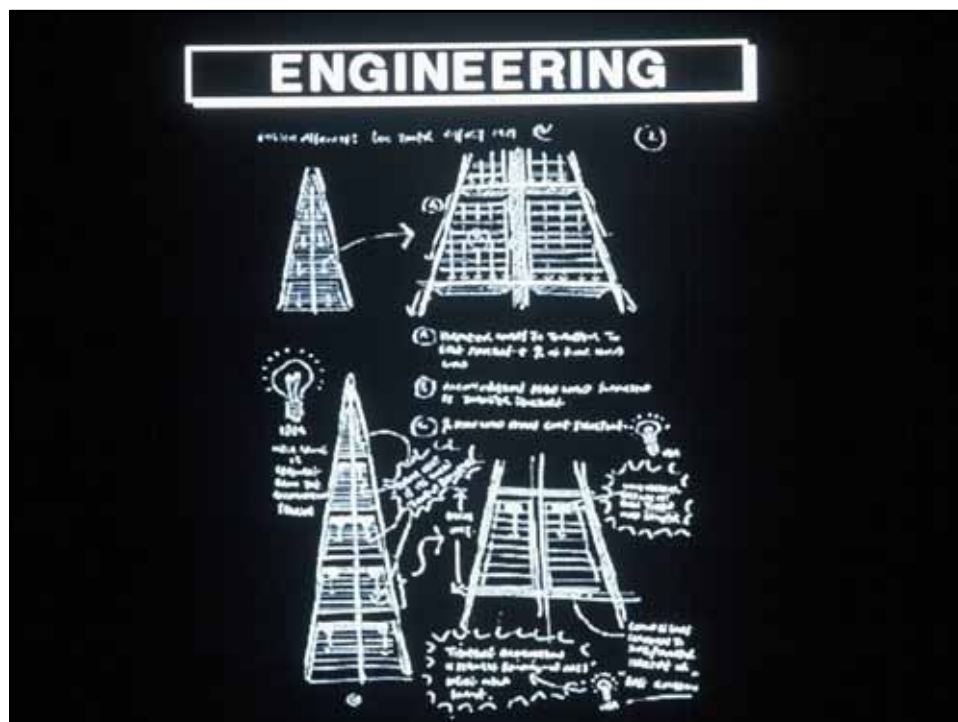


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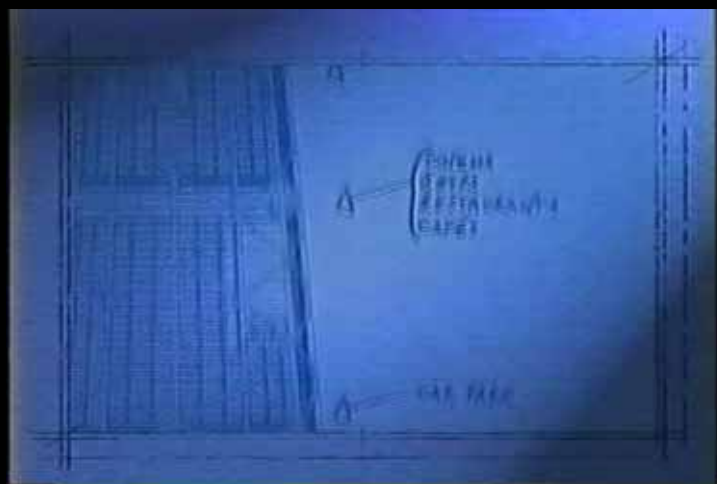


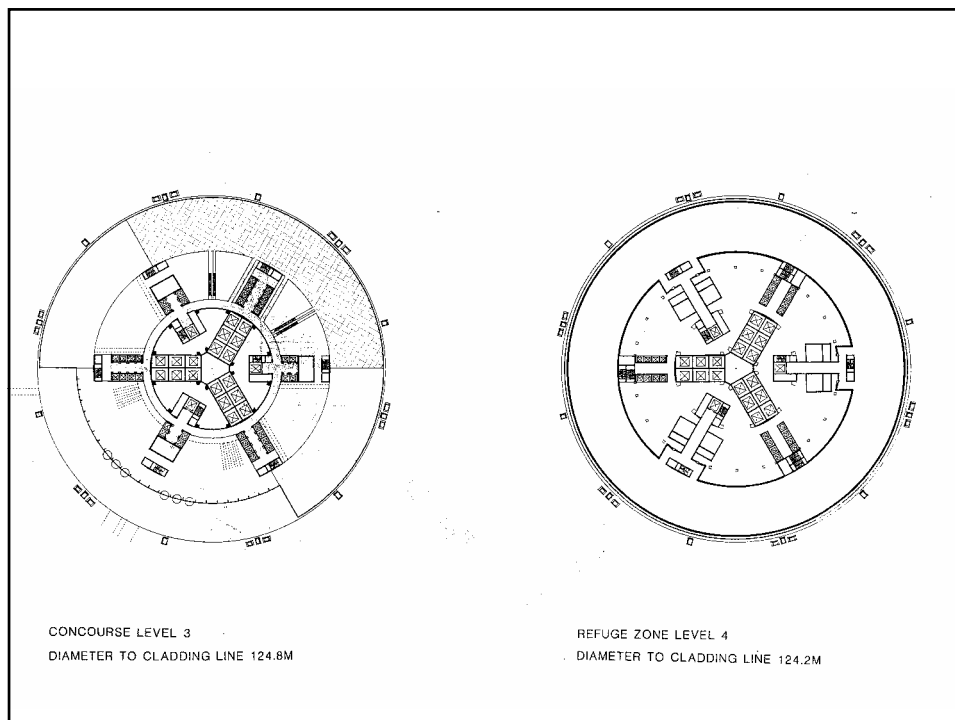
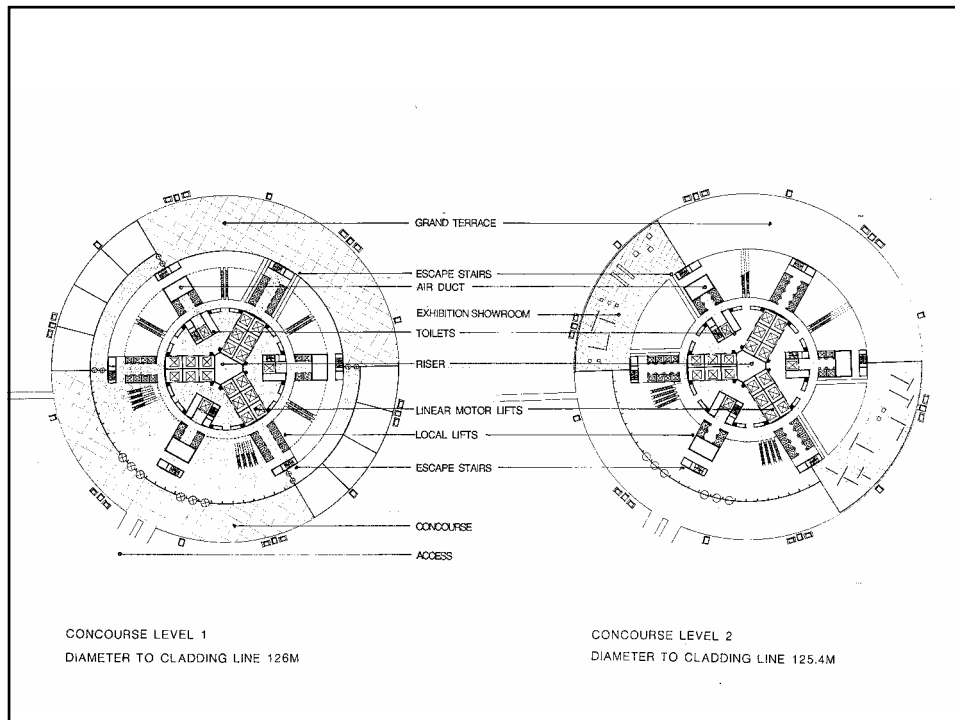


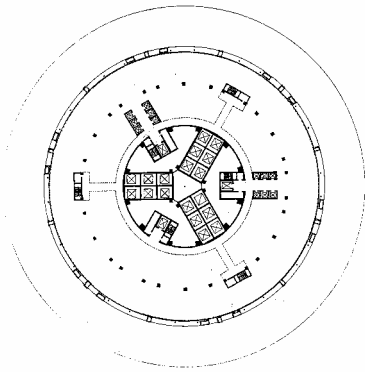
Architectural Concept

Helical structure

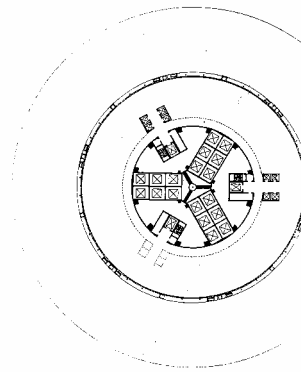
- ✓ tapering cylindrical form
- ✓ Total edifice: 800 meters
- ✓ The gross area: over **1000000m²**
 - Intelligent office accommodation for **17000 working people**
 - Residential accommodation for **2000**
- ✓ **150 floors** with the five **Sky Centers** located at **every 30 floors**
- ✓ Rapid linear motor lifts
- ✓ Through the **Sky Center** to their **final destinations**
- ✓ **Entertainment center** (auditorium, cinemas, concert hall)
- ✓ **Retail group** (department store and associated shops)
- ✓ **Fitness facility** (gymnasium, pool, saunas)
- ✓ **First class hotel** and a multi-cuisine **restaurant complex**



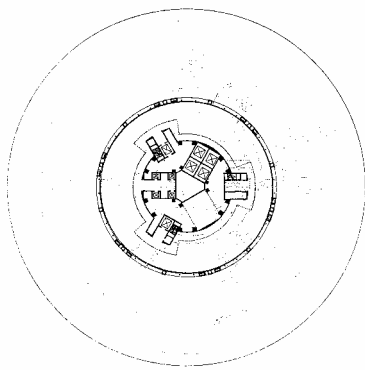




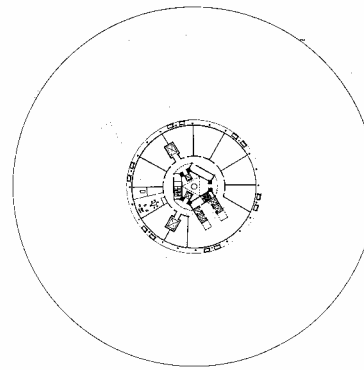
TYPICAL OFFICE FLOOR LEVEL 47
DIAMETER TO CLADDING LINE 98.4M



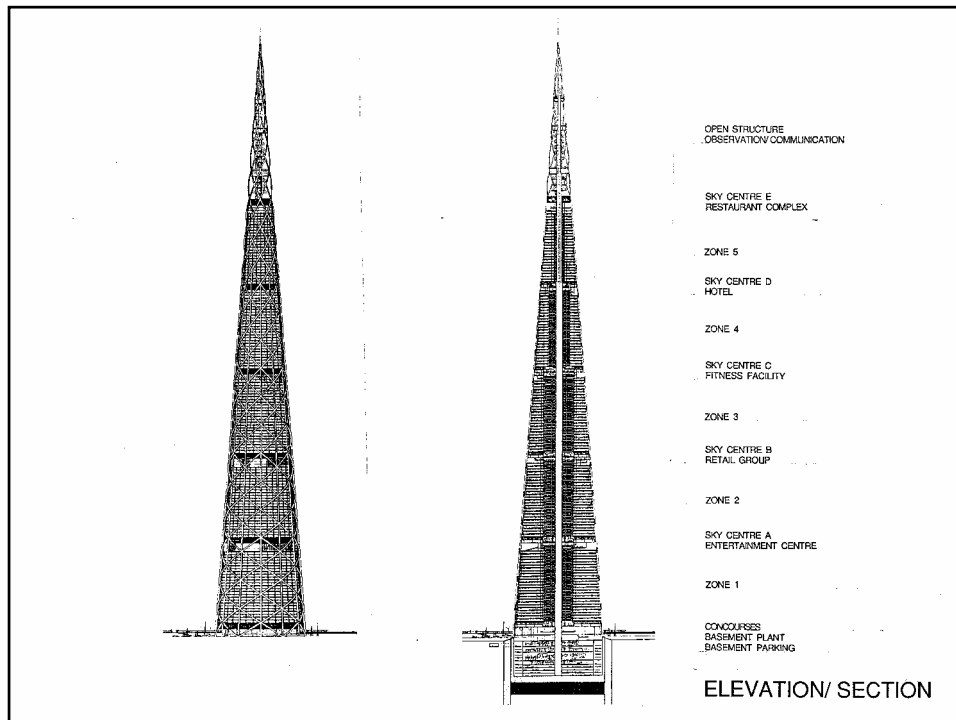
TYPICAL OFFICE FLOOR LEVEL 77
DIAMETER TO CLADDING LINE 80.4M



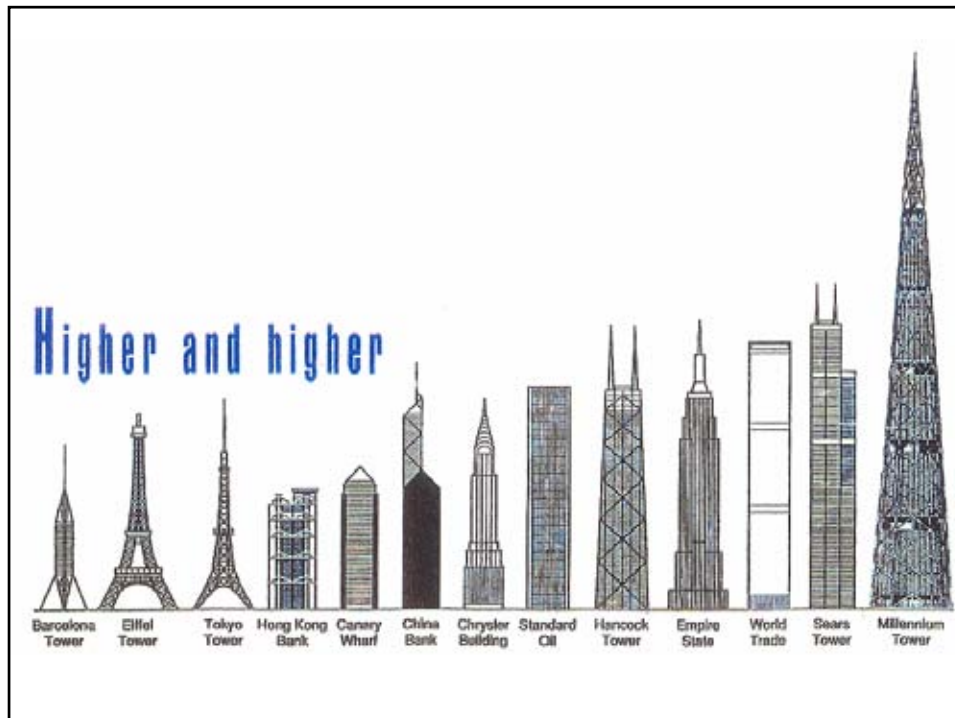
TYPICAL OFFICE FLOOR LEVEL 107
DIAMETER TO CLADDING LINE 62.4M



TYPICAL APARTMENT FLOOR LEVEL 137
DIAMETER TO CLADDING LINE 44.4M







Structural Concept

Structural system

Helical structure :

The effect of the open lattice at tower top

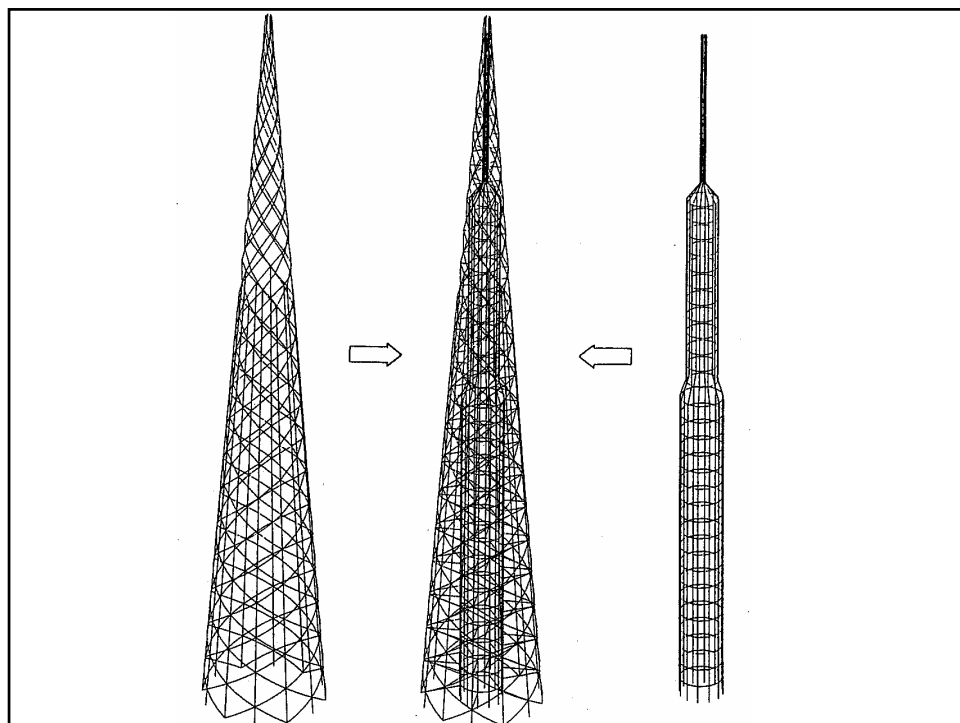
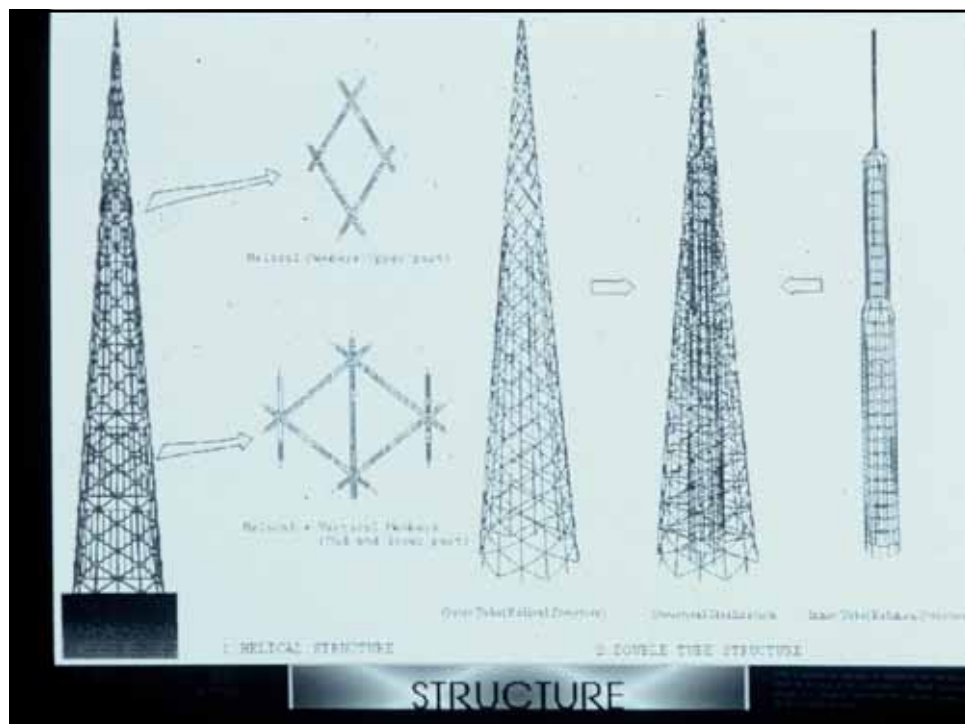
To reduce aerodynamic actions

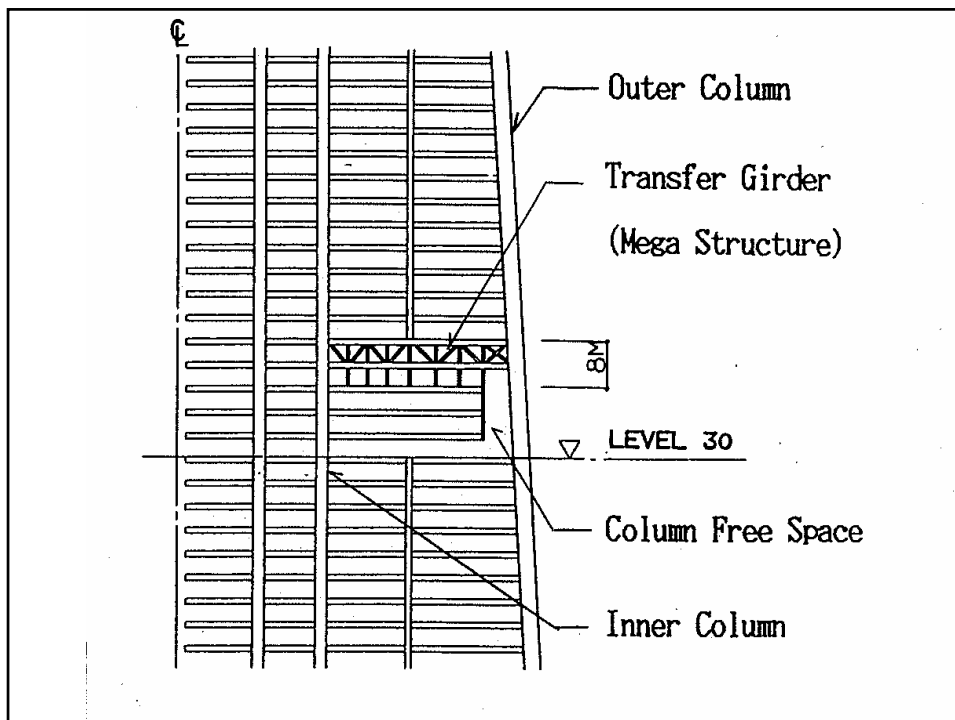
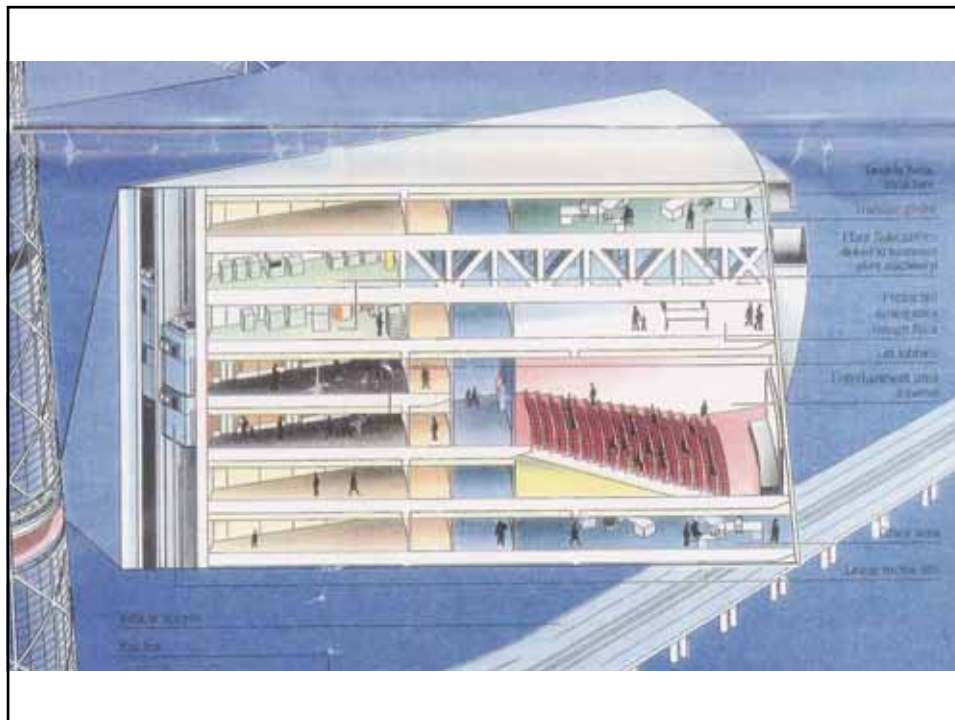
Perimeter frame consisting of 12 helical members
combined with Vertical members
a rigid net-like structure

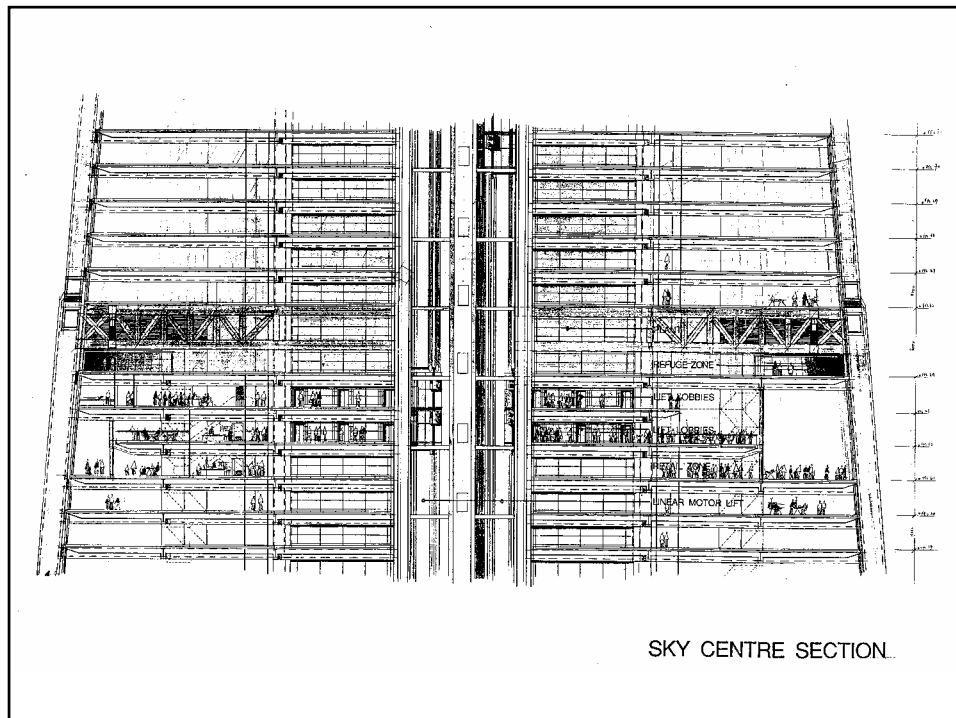
Tube-in-Tube Structure:

Mega-structure :

*Story-high **transfer girders** every 30 stories, allowing Sky
Centers below to have flexible **column-free spaces***







Structural Concept

Vibration Control Systems

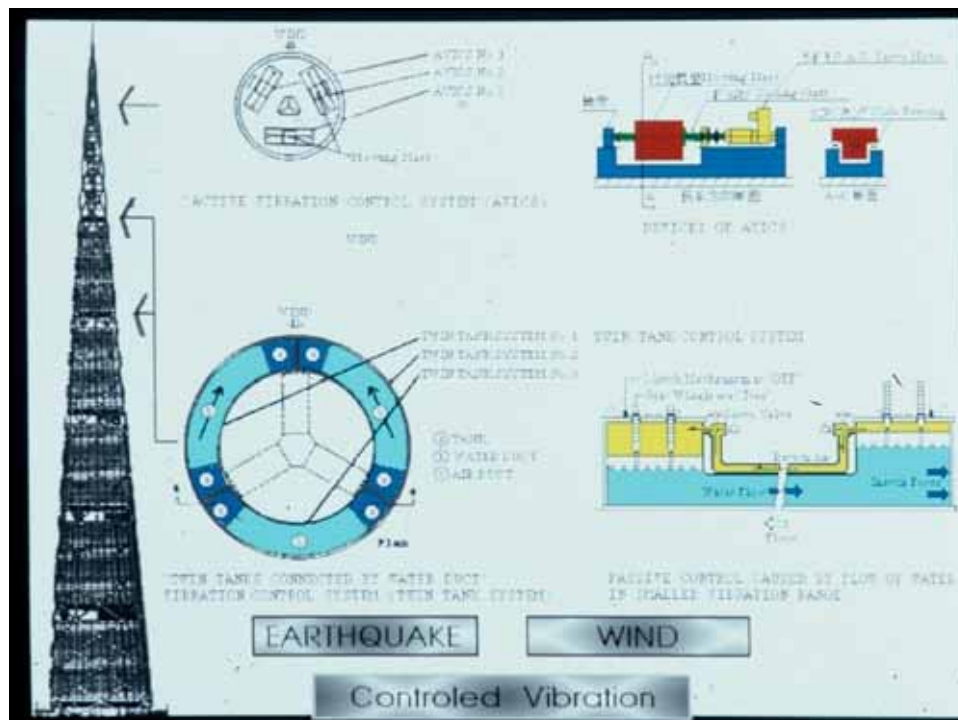
Active Vibration Control System (AVICS) :

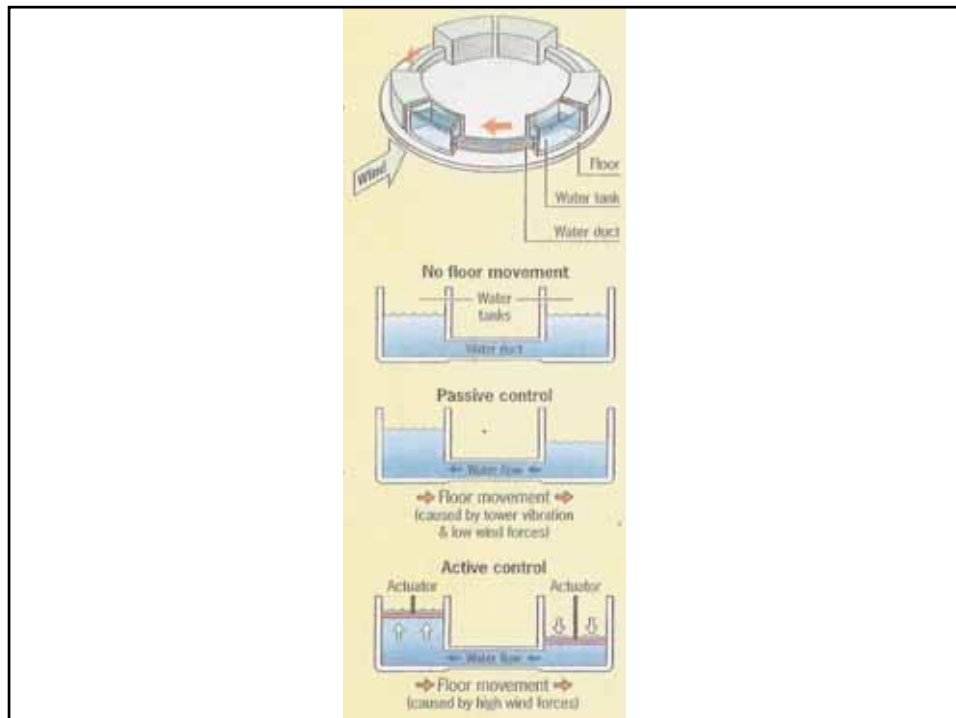
to control bending deformation

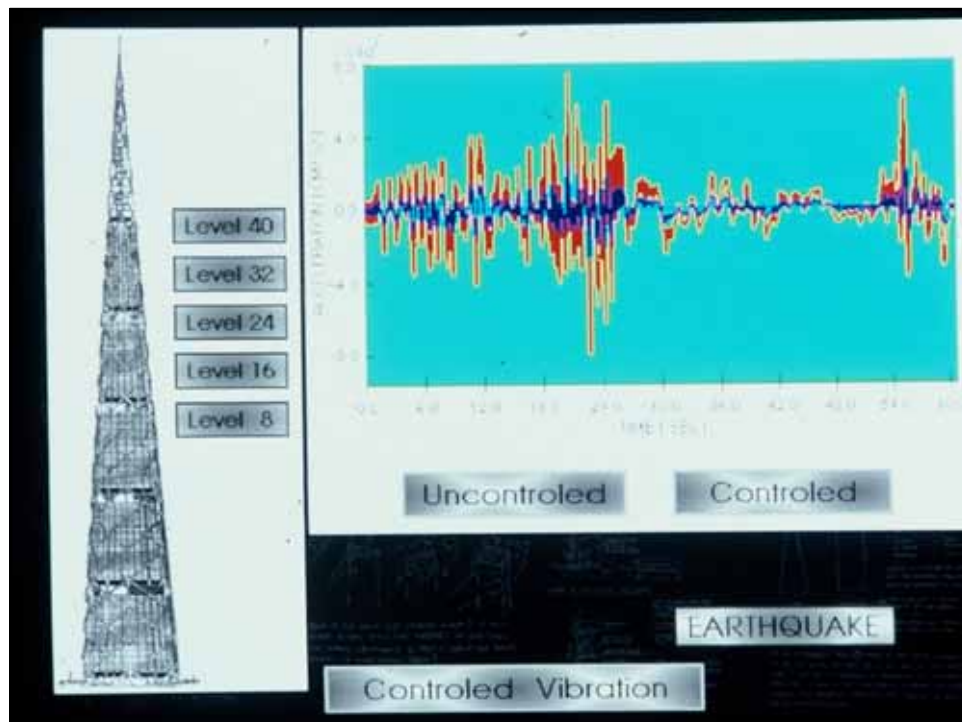
Water Tanks Vibration Control System :

Tanks located at the upper two Sky Centre
utilized both a passive and an active vibration control system

- ✓ For smaller levels of vibration (passive control force)
by the flow of water between the two tanks due to gravity
- ✓ For larger levels of vibration (the active water flow)
by computer-controlled actuators









Building Service

Service Principles

Cogeneration system

*electric power is generated by gas-driven generators
the heat produced is utilized for air conditioning*

Incineration and heat recycling

Desalination system

Building Service

Lift System

A combination of linear-motor lifts and conventional lifts

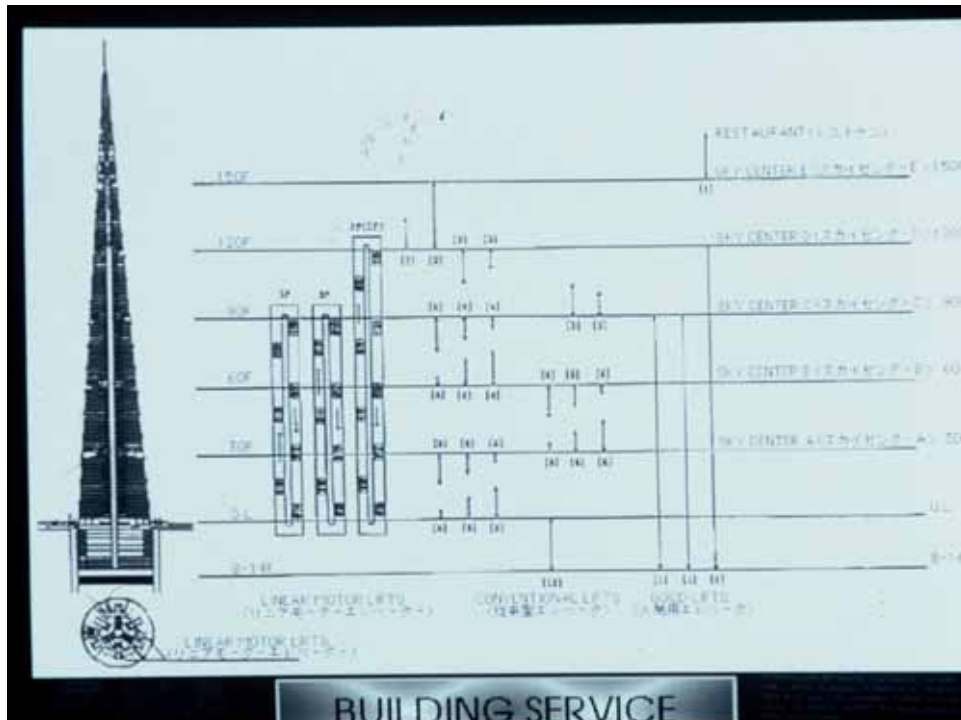
Linear motor lifts:

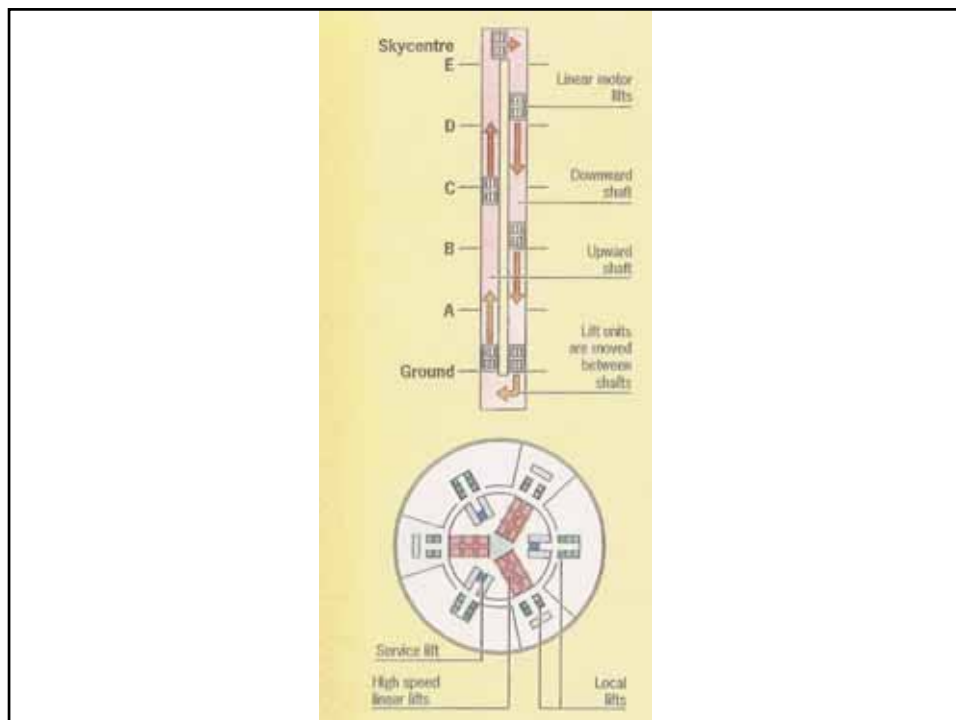
Rapid transportation

- ✓ Stopping only at Sky Centers
- ✓ double-decker type
- ✓ maximum capacity of 80persons

Conventional lifts:

- ✓ Double-decker type
- ✓ From a Sky Center to all floors as branch lines





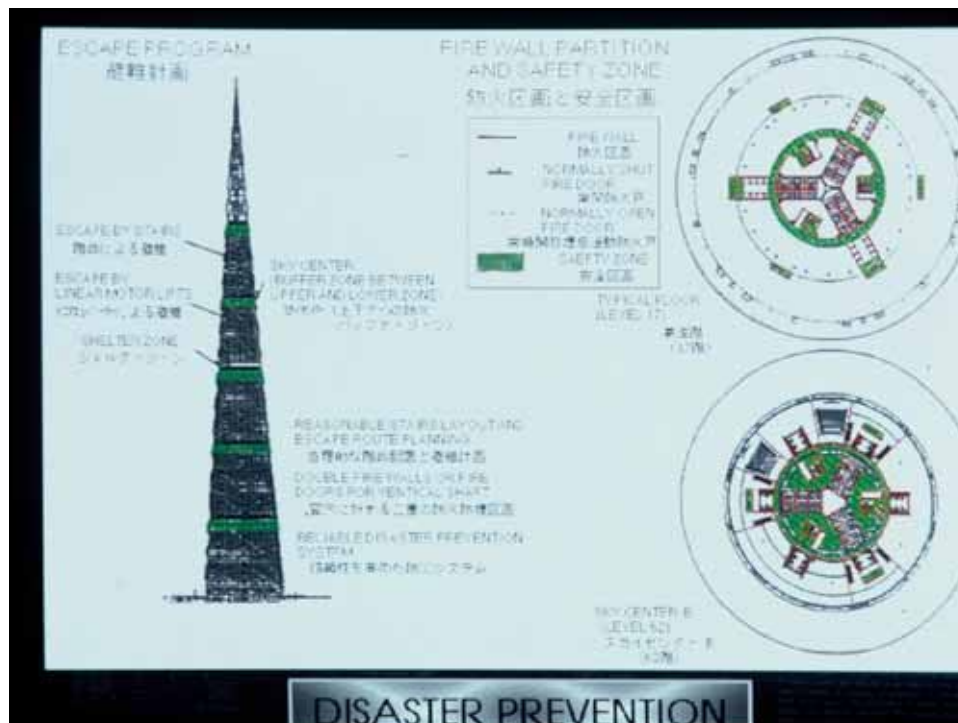
Building Service

Disaster Prevention Plan

In case of fires...

*Escape stairs are provided to **four-hour-rated refuge zones** above each Sky Center.*

- ✓ these zones are protected by double fire walls
- ✓ smoke prevention enclosures around all voids and shafts



Construction

Construction method

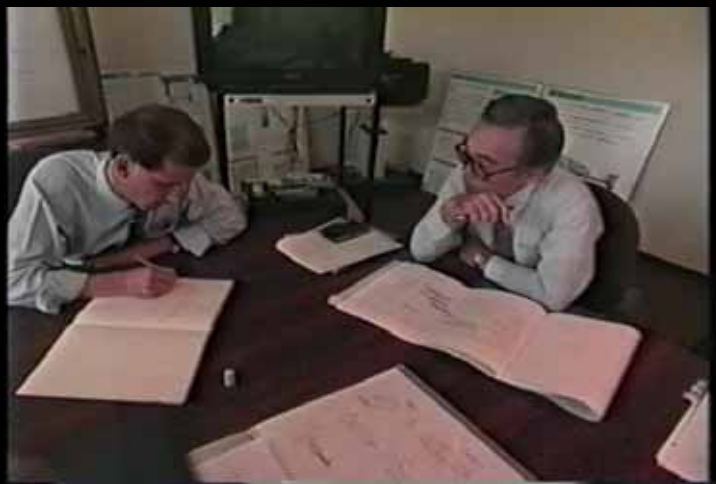
⟨Core Construction Plant⟩ all-weather self-lifting

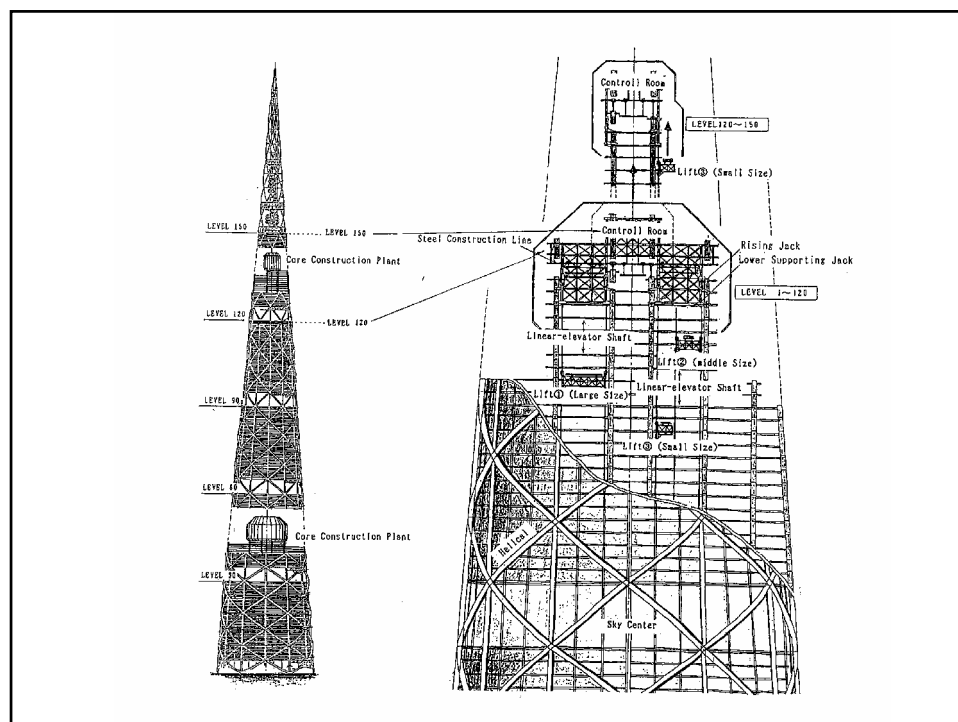
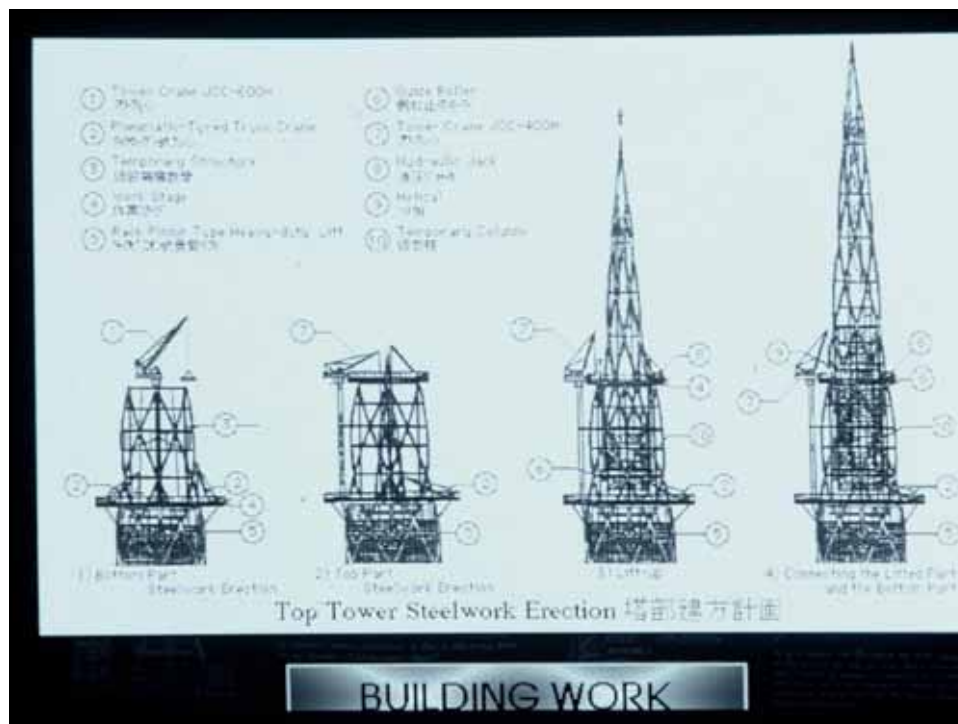
For the erection and welding of the steel frames

The perimeter helical steel frame will be erected by heavy duty mobile cranes mounted on already constructed floors

⟨Lift Up⟩ method

For the construction of the tower's top portion





Construction

Time schedule

10 years to complete the whole construction

Civil engineering works	4 years
<i>Foundation works</i>	<i>(3.5 years)</i>
<i>Bridge construction works</i>	<i>(3.7 years)</i>
Architectural works	6 years
<i>Foundation and basement</i>	<i>(1.0 years)</i>
<i>Superstructure</i>	<i>(5.0 years)</i>
<i>Steel work</i>	<i>(3.3 years)</i>
<i>Exterior finishes</i>	<i>(2.5 years)</i>
<i>Linear motor lifts</i>	<i>(1.5 years)</i>
<i>Interior finishes</i>	<i>(3.5 years)</i>

Conclusion

*Millennium Tower will provide a totally **new urban concept**. It will demonstrate an alternative to alienating, polluting , fragmented existing urban development. It will stimulate a revival of man's enjoyment of his environment and endeavor. It will contribute to the primary task of making better places to live and work. Informed by the past, conscious of the problems of the present, Millennium Tower will provide a **stunning prototype for the future**.*

