MEGA TALL BUILDINGS & FUTURE PLACES OF WORK

CO-CHAIRS:

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URBANIZATION TRENDS

‘1M people move to cities every week’
UN Habitat

‘By 2035 2B more people will live in cities’
International Organization for Migration (IOM)

‘In 2030, there will be 41 megacities (28 in 2014)’
RISE OF CITIES

Cities are getting taller

2000
Average: 375 m (1,230 ft)

2010
Average: 439 m (1,440 ft)

2020
Average: 598 m (1,962 ft)

Mega: 600 m

Super: 300 m

Figure: A study of the tallest 20 buildings per decade. © CTBUH
FOUNDATIONAL TECHNOLOGIES

1874
Electric Lighting
Incandescent Light Bulb

1884
Home Insurance Building
First Steel Frame Contraction

1854
Otis Elevator Brake

1906
Carrier Air-Conditioning
‘Apparatus for Treating Air’

Figure: Timeline of skyscrapers @ www.ComplianceBuilding.com
::challenges

(M.P. Gutierrez, 2017)
CLIENT

CONTRACTOR

COST ANALYSIS

MECHANICAL ENGINEERING

ACOUSTICAL ENGINEERING

CIVIL ENGINEERING

STRUCTURAL ENGINEERING

ELECTRICAL ENGINEERING

DESIGN

SUSTAINABLE BUILDING SYSTEMS

ARCHITECT

BUILDING TECHNOLOGY

CONTRACTOR

( M.P. Gutierrez, ARQ Cambridge, 2014)
SUSTAINABLE BUILDING SYSTEMS

ARCHITECT

BUILDING TECHNOLOGY

MECHANICAL ENGINEERING

BIO ENGINEERING

PHYSICS

CHEMISTRY

COMPUTER SCIENCE

MATERIAL SCIENCE

( M.P. Gutierrez, ARQ Cambridge, 2014)
SCALE - CIRCULATION

TRANSPORT: ELEVATORS

‘All safe, Gentleman, all safe’
Elisha Graves Otis, 1854
Breakthrough above 5 floors

HUMAN INTERFACING

Evolution of Elevators
A'DAM tower in Amsterdam - Lift with dynamic light show at the A'DAM Tower, Amsterdam.
Designed by InventDesign, photography by Dennis Bouman. Image © InventDesign.
The Evolution of Elevators

Stephen R. Nichols

United Technologies Research Center; East Hartford, CT; USA

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Steel and reinforced concrete that enabled buildings above 80 m
IMPOSSIBLY HIGH SUPER SKYSCRAPERS

Dr. Michael H. Ramage

University of Cambridge

Light Earth Designs LLP

Starting materials:
- methyl methacrylate (MMA)
- ethylene dimethacrylate (EDMA)
- glycidyl methacrylate (GMA)
- hydroxyethyl methacrylate (HEMA)

Plant Sciences • Biochemistry • Chemistry • Fluid Mechanics • Architecture • Engineering
INTEGRATING BIOLOGY INTO THE BUILT ENVIRONMENT

BUILDING STRUCTURE

Building resistant to wind, earthquakes, water

POWER OF & WITH NATURE

BIOLOGY, MATHEMATICS, AND DIGITAL FABRICATION
APPLICATIONS OF INSIGHTS FROM BIOLOGY AND MATHEMATICS TO THE DESIGN OF MATERIAL STRUCTURES

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Dynamic Reciprocity

Structural Color at the Human Scale

Intensity Sensing Prototype, eSkin

eSkin Building Facade

Image courtesy Jones Lab

Image Courtesy Shu Yang Group

Kirigami Geometry