Architectural Design Concepts of Buildings

Multi Hazard building Bye-laws & Zoning regulations

Energy Efficiency, Green Building Techniques for Sustainable and Safe Habitats.

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Current Seismic Design

H. Only Human life to be safe
B. Building cannot use after repair
C. No Continuous Use after earthquake

We can not make our city sustainable and resilience against big earthquake. We need to change our seismic design concept.
12 story Steel Concrete Apartment Building of Sendai-City

Courtesy of Prof. Yasushi Sanada, Osaka University
Christchurch before 2011 Earthquake
Christchurch after 2011 Earthquake
“Designed to protect life in extreme event, but damage is expected” Prof. Stephen Mahin said.
Protect people life, but damages of so many buildings are expected.
New Seismic Design

H. Human life have to be safe
B. Building can use after some repaired
C. Continuous Use just after earthquake

Against Small and Medium Earthquake -----
We can satisfy H, B and C easily.

Against Big Earthquake -----
We have to satisfy H and B, some case C
New Seismic Structures

- Seismic Isolated Structures
- Passive Controlled Structures
- Other Good Structures
Shosoin more than 1300 years ago
Shosoin more than 1300 years ago years
Seismic isolated twin steel tall building in TITech
Seismic Isolated Steel Tall Building constructing in TITech Now

Capacity: +20mm

Uplift of Isolator

4 Stepping Columns
Damage Controlled Structures

Building Structures = Primary Structure + Seismic Members

(To Support Vertical Load) (To absorb earthquake energy)
A Fuse protecting important PC
「新技術による既存建築物の耐震性向上技術の開発」
Framing Plan & Elevation
We, Civil engineers, have a mission to make the world a better place to live.
Concept Beyond formal definition is:

An idea, thought or notion that forms the backbone and foundation of a design project and one that drives it forward. It becomes the force and identity behind a projects progress.

An architectural concept is the meaning and reason to the end product and is the very first part of the design process to be developed and realised much like a seed to plant.

And just like a plant seed it can come from a vast array of sources, and produce a huge amount of variations and outcomes.
As a Formal Definition Architectural Concept Described as:

- Idea
- Notion
- Opinion
- Abstraction
- Philosophy
- Belief
- Inspiration
- Thought
- Intention
- Theory
- Image
- Hypothesis
Architectural Ideas

Architectural ideas are concepts that have been reduced to a formal architectonic concern like, space, sequences of spaces, integration of structure and form, and sitting in the landscape.

So it is much concern with the composition and spatial arrangement
Diagrammatic Metamorphoses

Phase I: Concept Study

CONCEPT

CONCEPT

CONCEPT

CONCEPT

CCTV Headquarters

Peter Eisenman
Moss Reinhardts
House
1992

Rem Koolhaas
Central Chinese
T.R. Baldy
2008

NMDA Steinad
Keeling
Harbor
Service Building
2017

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Themes

A theme is a specific pattern or idea that carry on throughout the design of a project. Most of the architectural schools of thoughts deals with themes.
Super Organizing Ideas

Super organizing ideas refer to the general geometric configurations or hierarchies that the parts of a project should respect.

The building prototype morphology is one form of the super organizing ideas.
Five Types of Concepts

- Analogies (looking at other things).
- Metaphors (looking at abstractions).
- Essences (looking beyond the programmatic needs).
- Problem Solving (looking at the requirements).
- Ideals (looking at values).
Analogy

Most frequently used device to identify possible, literal relationships between things.

One thing is identified as having all the desired characteristics, and thus it becomes a model. *(Source, Reference)* for the project at hand *(Target)*

Direct analogy can be used in which one building provides an appropriate image for another project.

Indirect analogy used to perform more abstraction.
Analogy

Inside the architecture  |  Outside the architecture

Direct analogy

Indirect analogy
Direct vs Indirect
Indirect Analogy from inside the architectural
Source of Analogy

NATURE PLANTS ANIMAL OR HUMAN

MANMADE, MACHINE, STRUCTURE, GEOMETRY OR CONTEXT
Metaphor

Identify relationships between source and target. However, the relationships are more abstract rather than literal.

Metaphors use the words "like" or "as" to express a relationship. It identify possible patterns of parallel relationships while analogies identify possible literal relationships.
Essences concentrate aspects of more complex issues into terse, explicit statements.

Essence brings insights into the most critical and basic aspects of the thing being analysed.

A statement of the essence of something can also be the result of discovering and identifying the roots of an issue.
Problem Solving
(Direct Response)

Not all concepts capture the essence of a project, nor do they all symbolize the function of all the activities in a building.

Concepts can be developed around more pragmatic issues often explicitly identified in the building program.

While many architects take pride in their ability to solve a client’s problems, only a few actually make a pragmatic approach sound inspiring and many designers unconsciously avoid working on the problem at hand while trying to be creative.
Ideals

Which suggest that the architect look inside the problem to discover appropriate, ideal concepts are those that architects bring to the problem.

If architects bring the right concept to the project, they are praised for their genius.

If their choice is inappropriate, it becomes a preconception and their basic competence is questioned.

Ideal concepts represent the highest aspirations and goals of the architect.
Concept Generators
Site Determinants

- Topography
- Climate
- Geography
- Demographic
- Geology
- History
- Social characteristics and conditions
- Economic conditions
- Legal, legislative and administrative conditions
- Location and visual aspects
- Land use
- Characteristics of man-made environment
- Circulation
- Technology
- Others
Physical Concepts

- Location
- View
- Harmony with nature
- Underground architecture
Cultural Factors

- Historical factors
- Religious factors
- Social factors
- Economic factors
- Political factors
- Functional factors
Spatial Relations

- The pragmatic space
- The perceptual space
- The existential space
- The cognitive space
- The abstract space
Qualities of Space

- Proportion
- Scale
- Form
- Definition
- Color
- Texture
- Pattern
- Enclosure
- Light
- View
Visual Design Factors: Form Characteristics

- Continuity
- Sequence
- Repetition and Rhythm
- Balance: Symmetrical & Asymmetrical
- Proportion
- Pattern, texture and color
- Hierarchy
- Transparency
- Direction
- Motion
- Time
- Sensory Qualities
Visual Design Factors: Visual factors

- Visual perception:
  - Structural approach
  - Evaluative approach
  - Orientation
  - Spacescape

- Lynch 1 (Image of the City):
  path, node, edge, district, and landmarks

- Lynch 2 (Theory of Place):
  Legibility, Structure and Identity, Imageability and Sequentiality
Visual Design Factors: Visual Organization

Gestalt Theory (Proximity, similarity, continuity, closure)

- Law of Proximity
- Law of Similarity
- Law of Continuity: good continuance
- Law of Closure: forces of organization
- Symmetry, Inclusiveness, Unity, Harmony, Regularity, Conciseness, Maximal Simplicity
Visual Organization

- Figure/Ground
- Surface/Edge
- Outline/Object
- Autonomous figures
Architectural Compositions

- Unity
- Coherence
- Incoherence
Visual fields

- Minimal heterogeneity
- Proximity
- Resemblance
- Enclosure
- Common orientation
- Symmetry
- Repetition
Shape, Pattern, and Form

- Linear shape
- The circle
- The ring
- The organic shape
- The square
- The ellipse
- Star shape
- Hexagonal shape
- Rectilinear shape
- The grid
- Radiocentric shape
- Branch shape
- The organic pattern
Size (Scale)

- Monumental
- Bulky
- Minimal
- Human
- Vehicular
Color

- Theory of colors
- Formal organization
- Properties
- Perception
Age: The traditional and the modern

- ignore
- respect
- imitate
- copy
- contrast
- hide away
- integrate
Construction

- Materials
- Methods
- Systems
  - Cast-in-situ
  - Pre-cast
  - Lift-slab
  - Tunnel form
  - Flying shutters
  - Pre-stressed
Structure System

- Bearing walls
- Skeleton
- Shell and Vault
- Space truss
- Space frame
- Geodesic dome
- Tent Structure
- Folded plates
- Verandel Girders
- Verndeal Floors
- Tensile Structures
- ...

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What is a structure

The structure of a building (or other object) is the part which is responsible for maintaining the shape of the building under the influence of the forces, loads and other environmental factors to which it is subjected.
Structural understanding

The basic function of a structure is to transmit loads from the position of application of the load to the point of support and thus to the foundations in the ground.

Any structure must satisfy the following criteria:
(1) Aesthetics
(2) Economy
(3) Ease of maintenance.
(4) Durability.
(5) Fire resistance.
Safety and serviceability

There are two main requirements of any structure: it must be safe and it must be serviceable. ‘Safe’ means that the structure should not collapse – either in whole or in part. ‘Serviceable’ means that the structure should not deform unduly under the effects of deflection, cracking or vibration.
STRUCTURES!

- **Structures** = Things with a definite size and shape, which serve a definite purpose or function.

- To perform its function, every part of the structure must resist **forces** (stresses such as pushes or pulls) that could change its shape or size.

- The structure must also be able to support a **load**.

- **Load** = The weight carried or supported by a structure.
TYPES OF STRUCTURES...

• **Natural Structures**: Structures not made by people.

• Examples: feathers, sand dunes...

• **Manufactured Structures**: Structures that have been built by people.

• Examples: buildings, umbrellas, jigsaw puzzle...
CLASSIFYING STRUCTURES BY DESIGN...

- **Design** = How a structure is put together, how it is shaped and the materials used in the structure.

- **1) Mass Structure**
  A mass structure can be made by piling up or forming similar materials into a particular shape or design.

Examples???
MASS STRUCTURES...

• Natural Mass Structures

• Manufactured Mass Structures
TYPES OF STRUCTURES CONTINUED...

• 2) Frame Structures

Frame structures have a skeleton of very strong materials, which supports the weight of the roof and covering materials.

- Some frame structures are simple and consist only of a frame. Examples: ladders, spider webs...

- Some frame structures are more complex with added parts. Examples: bicycles, umbrellas...
FRAME STRUCTURES...
TYPES OF STRUCTURES CONTINUED...

• Shell Structures

Shell Structures are objects that use a thin, carefully shaped outer layer of material to provide their strength and rigidity.
CAN YOU MIX AND MATCH???

What are the following examples?

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VARIATION IN DESIGN...

• Does the variation in design of structures affect how well it functions?

• How would the roofed structures function differently?
HOW WOULD TIME AND PLACE AFFECT DESIGN??

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“Nature - geometry – architecture-structure”

A possible use for the architecture is found and visualized on the basis of parametric variations.
Any conceptual design can be created with Shape based Structural Innovations and optimization in High Rise buildings. The 3-D computer modeling technique seeks to find the most efficient shape of a physical system.
This creativity is possible thanks to a computational framework that allows engineers and architects the freedom to explore novel designs that are aesthetically pleasing while still satisfying principles from structural engineering and mechanics.
Shape optimization helps engineers determine where to place material within a design domain based on the loads and boundary conditions for a specific objective.
USA’s tallest building when completed. For this building Architect Santiago Calatrava was inspired by organic forms and used these forms for "visual excitation" only.
Greek firm Petra Architects have designed this 'blossoming Dubai' for their proposal for the Zaabeel park tall emblem structure.

Design is based on the form of a blossoming flower, the Dubai Flower.
Yongsan Dream Tower

Situated at Yongsan, Seoul designed by Sohn, Myung Gi and others considering eco-consciousness approaches in all the segments. The concept image of this tower is a symbolic icon and a landmark of Seoul which is the city of water.
High-Rise Shaping

TWISTERS

Twister

Angled Twister

Sliding Twister

Turning Torso, Malmö (by Calatrava);

Fordham Spire, Chicago (by Calatrava);

Gazprom, Petersburg (by RMJM)
High-Rise Shaping

EXTRUDERS

Ortho

Angler

Slider

Examples of EXTRUDERS: Anglers, Sliders, Tapering sliders and Slider assemblies
High-Rise Shaping

CONT'D.

**ROTORS**
(bulging) rotor

hyperboloid

boloid

Rotors examples; Globe segments, Bulging rotors, Cylinders, Squeezed rotors, Transformed rotors

Fairgrounds Redevelopment, Milan (by Libeskind); Swiss Re, London (by Foster&Partners); Westhafen Tower, Frankfurt (by Schneider + Schumacher); Communication tower, Valencia; Green Bird (by Future Systems); Torre Agbar, Barcelona (by J. Nouvel)
High-Rise Shaping CONT'D.

TORDOS

tordo

ortho-ruler

free-ruler

ortho-conoid

Infinity Tower, Dubai (by SOM)

Ocean Heights, Dubai (by Aedes)

Avaz Twist tower, Sarajevo, Bosnia-Herzegovina (by ADS Studio)
High-Rise Shaping

TRANSFORMERS

bender
flattened rotor

FREE-SHAPERS

remerge
carver
repeater

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Examples of FREE SHAPERS

Gazprom, Petersburg (by Herzog De Meuron)
Opus, Dubai (by Hadid);
Tower, Peru (by M. Ferri)
High-Rise Shaping

CONTD.

Special category: Rotators

Rotating Residences, Dubai (by Faisal Ali Moosa);
Time Residences tower, Dubai (by Howells/Palmer & Turner);
Da Vinci tower, Dubai (by Fisher);

Special Category: Slicers

Absolute World building 1, Mississauga, Canada (by MAD);
Slinky Twins, Paris (by PCA);
Nordhavnen Residences, Copenhagen (by 3XN)
High-Rise Shaping

Special Categories: Bio-climatic towers, Wind energizers

EDDIT tower, Singapore (by Yeang);
Commune towers Seoul (by Yeang);
Sustainable tower, Dubai (by Noura AlBaloushi);
Innovatoren, Venlo NL (by McDonough + Arcadis);
Bionic Tower (by Future Systems)

Bio-climatic performance is elaborated in basically all building types. Whereas bio-climatic buildings usually function with low wind velocities and are open to the surrounding climate, Wind-energizers tunnel an accelerated windflow to activate generators. These FORMS are the need of the present day to attain sustainability.
Santiago Calatrava's Palau de les Arts Reina Sofía, which is currently under construction, along with the entire complex of the Ciutat de les Arts i les Ciencies in Valencia, Spain, is an opera house constructed out of thin shell concrete forms,
Its continued to find uses for this particular structural form—from the most basic of applications, like shading a street, where temperatures can rise above 40 degrees Celsius daily to more complex applications of pneumatic roof structures.
Tension hoop ideas are still being employed today in modern sports arena construction, as seen in the Berlin Olympiastadion.
Spaceframes exploit the tensile capacities of materials in grid-like forms, inlaying them with plexiglass or other durable materials. Unlike tensile frame structures, spaceframes are inherently more rigid, more stable, and more closely related to three-dimensional trusses rather than two-dimensional string and skin construction.
By their nature, bridges are purely structural in form. Evolved, efficient designs are attributed to scientific material and mechanical genius, rather than aesthetic, artistic expression. However, throughout the history of bridge engineering, different forms and types have emerged that are both structurally efficient and aesthetically pristine, giving modern designers numerous options in terms of possible structural solutions.
Today’s one of the most rewarding professions is the designer working in art business. A design process involves a series of creative activities including research, analysis and decision making. The designer creates designs that are attractive and functional and uniquely suited to the human needs.

Özezen’s costume designs inspired by Sydney Opera House
The vibrant, bright colors and typical wooden structure of the houses in La Boca have inspired fiimflek
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GALATA TOWER
One of the most striking landmarks of Istanbul, Galata Tower has dominated Beyoğlu’s skyline since 1348 inspired Horuzoğlu’s costume designs.
Maruldal’s costume designs inspired by Taj Mahal
The Congress Hall is a timeless, modern architecture and ideal spatial configuration located in the center of Berlin.

Yüksek’s costume designs inspired by Kongresshalle
Old version

Patch work

Patch ..no..work

New version
Multi Hazard building Bye-laws & Zoning regulations
The Indian Sub continent is vulnerable to various kinds of disasters. Some of the Natural disasters have been highlighted in the presentation:

- Earthquake
- Urban Flooding
- Tsunami
- Cyclone

Presentation highlights the different types of Natural Disaster and Efforts towards mitigation of disaster.
CITIES/TOWNS FALLING IN SEISMIC VULNERABLE ZONES

Earthquake

Zone V - Very High Risk Zone: (Intensity 9 and above)
Srinagar, Dharamshala, Guwahati, Shillong, Aizawl, Agartala, Imphal, Jorhat, Kohima, Tezpur, Itanagar, Bhuj and Port Blair.

Zone IV – High Risk Zone: (Intensity 8)
Jammu, Shimla, Amritsar, Jalandhar, Chandigarh, Delhi, Meerut, Gorakhpur, Naintal, Roorkee, Patna, Gangtok and Jamnagar.

Zone III - Moderately Risk Zone: (Intensity 7)
Agra, Lucknow, Varanasi, Dhanbad, Asansol, Kolkata, Ahmedabad, Vadodara, Indore, Surat, Nashik, Pune, Mangalore, Chennai, Kochi and Trivandrum.

About 59% of land area liable to seismic hazard damage
FACTORS RESPONSIBLE OF EARTHQUAKE RELATED DISASTERS

- **Location** of cities/towns in seismic areas, especially on poorly consolidated soils, on ground prone to landslips or along fault lines.

- Building **Infrastructure** such as houses, bridges, dams, which are not resistant to ground motion.

- **Unreinforced masonry** buildings with heavy roofs are more vulnerable.

- **High density** of buildings per hectare with high occupancy(high rise high density) without any room for ingress and egress of fire-tenders/vehicles for emergency measures.

- Lack of access to information about earthquake risks.
ATTEMPT FOR BUILDING REGULATION TOWARDS EARTHQUAKE SAFETY


Prof. Arya Committee Report (MHA):

- MHA constituted the Prof. Arya Committee in 2007.
- In 2008, the Prof. Arya Committee Reports were also circulated to all the State Governments.

Four important aspects of report:
- Zoning regulations.
- Additional Provisions in Development Control Regulations for Safety.
- Additional Provisions in Building Regulations/Byelaws for Structural Safety - In Natural Hazard Zones of India.

Details of various BIS codes relating to Structural Safety for natural hazard are given for the guidance of the professionals to design structures/buildings, keeping in view of the provisions of such codes to combat different natural hazards.
Revised Model Building Bye-laws, 2014

- The revised Model Building Bye-Laws, 2014 incorporates the Prof. Arya Committee recommendations:
  - Structural Design And Safety
  - Additional Provisions In Building Regulations/ Bye-laws For Natural Hazard Prone Areas
  - Occupant Load and Structural Design Basis Report
  - Seismic Strengthening/Retrofitting
  - Review Of Structural Design
  - Certification Regarding Structural Safety In Design
  - Constructional Safety
  - Quality Control And Inspection
  - Structural Requirements Of Low Cost Housing
  - Issue Of Occupancy Certificate
  - Protective Measures In Natural Hazard Prone Areas
  - Registration Of Professionals
  - Professional Fees For SER/SDAR And CER/CMAR
  - Alternative Materials, Methods Of Design And Construction And Tests
Urban Flooding
(Over 40 million hectares (12 per cent of land) is prone to floods and river erosion)

Cities having Average Annual Rainfall < 1000 mm
Ahmedabad, Bengaluru, Hyderabad, Jaipur, New Delhi, Srinagar.

Cities having Annual Rainfall from 1000 to 1500 mm
Bhopal, Chennai, Chandigarh, Lucknow, Nagpur, Patna.

Cities having Average Annual Rainfall above 1500 mm
Bhubaneswar, Goa, Guwahati, Kolkata, Mumbai, Thiruvananthapuram
FACTORS RESPONSIBLE FOR URBAN FLOODING

- Violations of Zoning regulations in congested areas.
- Unorganized development in form of slums/squatters encroaching natural drainage channels, thereby leading to urban flooding.
- Silting up of catchment basins and drains with overflow of drains.
- Constructions spanning this area in and around the River Plains and specially in the low lying Flood Plains results in the change of flow patterns in the rivers.
MEASURES TO MITIGATE URBAN FLOODING

- Master Plan of a town, areas vulnerable to flooding are to be delineated for which *Flood zoning Maps* are to be prepared and appropriate development control is to be prescribed based on the degree of risk associated.

- An *inventory of drainage and sewerage system* for the entire city is to be prepared and mapped into Utility maps. Water logging, Sewerage and Drainage improvement /augmentation needs can be addressed.

- *Water Resource Management Plan* is needed for identifying areas receiving high rainfall and low rainfall along with coefficient of runoff.

- Action plan for preventive measures like raising the height of river embankment, afforestation in the catchment areas of river, periodic review of water flow from the barrages and information on the water discharge so that steps may be taken in advance to rehabilitate people likely to be affected by floods.
MEASURES TO MITIGATE URBAN FLOODING

- Strict enforcement of *Zoning regulations and Building Bye-Laws* is needed in flood prone areas. In Master Plans, the *Flood plains* need to be declared *as litter free and no construction zone* and may be designated for intensive agriculture/horticulture.

- For major land use changes, *impact assessment* should be made mandatory for the towns with sparse open spaces / green or are vulnerable to encroachment / development to reduce the chances of flooding.

- *Slope analysis and runoffs* need to be assessed with areas of natural vegetation and plans must take these aspects into account.

- Strict *periodic cleaning of urban drains and sewer* lines is to be carried out by the ULBs and Development Authorities including screening chambers to reduce the chances of flooding during monsoons.
Tsunami (5,700 km coastline is prone to Tsunamis)

Tsunami Zone are defined as:
Zone-1 maximum water depth 0-3m
Zone-2 maximum water depth 3-6m
Zone-3 maximum water depth 6-9m
Zone maximum water depth > 9 m

Coastal State
Tamil Nadu, Puducherry, Andhra Pradesh, Orissa, West Bengal, Andaman & Nicobar, Gujarat, Dadra & Nagar Haveli, Daman & Diu, Maharashtra, Goa, Karnataka, Kerala Lakhsadweep.
FACTORS RESPONSIBLE OF TSUNAMI RELATED DISASTERS

*Tsunami* are ocean waves caused by under sea *Volcanic Eruptions, Earthquakes and Landslides* with waves travelling at high speeds.

- Coastal Towns are prone to Tsunami hazards for their proximity to shores.
- Landuse and habitation density in the Tsunami prone Coastal Zone also determines the extent of damage and loss.
- Environmental degradation due to urbanization.
- Haphazard urbanization along the coastal areas.
- Preparedness and Early warning systems and their efficiency.
MEASURES to MITIGATE- TSUNAMI DISASTERS

- Preparation of coastal land use map on large scale.
- Strict Implementation of the CRZ regulations for planning Costal Towns.
- Planned layouts with easy “Evacuation routes” in case of early and swift evacuation.
- Low rise, medium density developments beyond the CRZ in prone coastal towns.
- Provisions of Early Warning systems by the Local Authorities
- Community Based- Costal Zone Management and
- Community Based Information Systems.
CITIES/TOWNS /DISTRICTS FALLING IN VULNERABLE CYCLONE ZONES

**Cyclone**
(5,700 km coastline is prone to cyclones)

**Very High Damage Risk Zone –B** ($V_b = 50\text{ m/s}$)
East Godavari, Krishna, Guntur, Prakasam, Vizianagaram, Nellore, Visakhapatnam, srikulam, Kachchh, Junagadh, Cuttack, Ganjam, Jagatsinghpur, Kendrapara, Khurdha, Puri, Balasore, Bhadrak, Jajpur, Thanjavur, Cuddalore, Kanchipuram, Tiruvallur, Tiruvanamalai, Viluppuram, Ramanathapuram, Nagapattinam, Thoothukudi, Tirunelveli

**High Damage Risk Zone** ($V_b = 47\text{ m/s}$)

**Moderate Damage Risk Zone-A** ($V_b = 44\text{ m/s}$)

**Moderate Damage Risk Zone-B** ($V_b = 33\text{ m/s}$)

where $V_b$ is – Basic Wind Speed
Cities and towns are prone to Cyclone hazard due to:

• Climate Change Patterns.
• Environmental changes and degradation.
• Loss of Green Cover and Mangroves along the shoreline.

Cyclone related hazards for coastal towns:

• Flooding- Coasts and Inland
• Beach Erosion.
• Damage to Structures.
• Loss of Power and Communication
• Land Subsistence
• Crop Destruction
• Contamination of water and food.
• Injuries and loss of life.
Planning is a **sequential and continuous process**, involving a series of measures and steps at various levels.

**Formulation of Spatial Master Plan** involves coordinated **Sectoral plans**, effective management of disaster needs clear-cut priorities and appropriately coordinated actions between Central and State governments.

New buildings approvals to be in consonance with earthquake resistant regulations and all existing buildings to be rigorously checked for structural stability.

**Disaster Management Plan** should be integrated within the context of overall **Master Plan**. Existing land-use maps needs to indicate hazard prone areas keeping in view the regulations for **Land Use Zoning and regulations for Natural Hazard Prone areas**.

**Mapping and Mitigation Plan** for Unregulated mixed land use developments on narrow streets to evacuate in disaster event.
STEPS NEED TO BE TAKEN FOR PREVENTING DISASTER FROM TOWN PLANNING POINT OF VIEW

- Area / buildings for evacuation purposes and **temporary shelter** to be earmarked.
- Detailed GIS and remote sensing based micro-zonation and **hazard maps** need to be prepared and revising and updating the Vulnerability Atlas for all States.
- The State Town and Country Planning Departments, Development Authorities, ULBs and State Disaster Management Agencies need to work in close coordination.
- Need for **Capacity Building** of town planners, engineers and architects in safe design and construction of new buildings and for strengthening of existing unsafe buildings and structures through retrofitting.
- Disaster-resistant features specified in **National Building Code** should be adhered to.
<table>
<thead>
<tr>
<th>Plans</th>
<th>Parameters</th>
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</thead>
<tbody>
<tr>
<td>Perspective Plan</td>
<td>• Climatological studies, identification of areas prone to hazards&lt;br&gt;• Transportation-analysis of the existing network&lt;br&gt;• Social and Physical Infrastructure</td>
</tr>
<tr>
<td>Regional Plan</td>
<td>• Settlement pattern&lt;br&gt;• Transportation Network&lt;br&gt;• Social and Physical Infrastructure&lt;br&gt;• Environmentally sensitive areas- Hazard prone zones such as earthquake, floods/flash floods, high winds, cyclone, fire, land slide, tsunami, vulnerability and risk assessment of the region</td>
</tr>
<tr>
<td>Development Plan</td>
<td>• Hazard prone zones such as earthquake, floods/flash floods, high winds, cyclone, fire, land slide, tsunami&lt;br&gt;• Disaster mapping - vulnerability and risk assessment of the region&lt;br&gt;• All environmentally sensitive areas&lt;br&gt;• Assessment of Disaster management infrastructure to meet the requirement of prescribed in the District Disaster Management Plan</td>
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# DISASTER MITIGATION PARAMETERS ADDRESSED IN VARIOUS PLAN (as per URDPFI Guidelines, 2014)

<table>
<thead>
<tr>
<th>Plans</th>
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<tbody>
<tr>
<td>Local Area Plan</td>
<td>• Strategy for hazard zone and regulations</td>
</tr>
<tr>
<td>City Development Plans</td>
<td>• Existing situation</td>
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<tr>
<td></td>
<td>• Disaster prevention and management plan</td>
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<td></td>
<td>• Investment estimates</td>
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<td>• Training and other programs</td>
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<td></td>
<td>• Information management system</td>
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<td></td>
<td>• Implementation plan</td>
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<tr>
<td>Special Purpose Plan</td>
<td>Disaster Management Plan (as per NDMA guidelines)</td>
</tr>
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</table>
## DISASTER MANAGEMENT STRATEGIES FOR DIFFERENT SECTORS (URDPFI Guidelines, 2014)

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Strategy</th>
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| **Housing**                               | • Guidelines for construction of buildings on slopes  
                                          • Structural stability of buildings in hills and for the entire GMA  
                                          • Soil erosion and sedimentation control for construction in non-hill areas |
| **Ecologically sensitive urban planning** | • Demarcate eco-sensitive areas in the city as low/ no built up areas  
                                          • Bring in principles of climate resilient urban development based on environmental parameters like conservation of natural ecosystems, natural drainage patterns |
| **Urban infrastructure and services**     | • Augment the piped water supply network in the city  
                                          • Augment the water treatment capacity of the city  
                                          • Water Conservation and Rainwater harvesting  
                                          • Development of a sewerage system  
                                          • Monitoring water quality at disposal points  
                                          • Integrated natural drainage plan for the city  
                                          • Prepare and implement a storm water drainage plan |
| **Disaster Resilience**                   | • Preventive health measures  
                                          • Public health management and surveillance system  
                                          • Emergency medical response |
<table>
<thead>
<tr>
<th>Parameters</th>
<th>Buffer Zone</th>
</tr>
</thead>
</table>
| Natural hazard zones such as River flood plains and water bodies including wetlands | *Area likely to be affected by floods (up to 10-year frequency)* reserved only for gardens, parks, playgrounds, etc. All other habitable buildings to be prohibited in this zone.  
*Area liable to flooding (25-year frequency):* Residential buildings could be permitted with certain stipulation of construction on stilts (columns), minimum plinth levels, prohibition for construction of basements and minimum levels of approach roads, etc. |
| Coastal Regulation Zone                                                  | Coastal land up to 500 m from the High Tide Line (HTL) landward side and a stage of 100 m along banks of creeks, estuaries, backwater and rivers subject to tidal fluctuations is called the **Coastal Regulation Zone**, and is regulated for developmental activities |
BUFFERS FOR VARIOUS ACTIVITIES
(URDPFI Guidelines, 2014)

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Buffer Zone</th>
</tr>
</thead>
</table>
| Manmade hazard zones such as radioactive, chemical and gas treatment / processing / distribution lines | **Chemical Industry**
Development of buffer zones all around the industry and establish Off-Site responding agencies at an appropriate distance from the new installations.

**Nuclear Plants**
**Exclusion zone:** 500 Ha maintained as vacant space and developed as a green belt area.

**Sterilised Zone:** Area of 5 km radius. No restriction is imposed by the plant on organic development activities of population in the annulus between 1.5 and 5 kms. No influx of large population in this area.

**Population Restriction:**
Population density within 10 km radius: Less than two-third of state average;
Population within sterilised zone (5Km radius) Less than 20,000;
Population centres with more than 10,000 persons more than 10 km away;
Population centres with more than 100,000 person) more than 30 km away; |
Some Examples of Good Practices in Disaster Reduction in the context of Urban Planning Practice.

**Pre-disaster scenario**
layout of a sample block
narrow roads with dead ends,
irregular plots hinder immediate relief action
disaster evacuation process rendered difficult.

**Post disaster planning**
layout of a sample block
wide roads with loop roads,
regular plots, easy access and conducive
to immediate action
evacuation easy.
Well connected roads with fewer dead-ends.
Increased width of road.
Provision of Open spaces.
Plots are regular with restrictions on height.

After the earthquake, the State Town Planning Department redeveloped the area through Town Planning Scheme with following features which mitigates disaster.
Ministry of Urban Development took the initiative to ensure that the Layout Plans for Permanent Settlements in A & N Islands are taken up in accordance with current town planning norms and that these settlements come up as model townships, catering to the requirements of all facilities and amenities like schools, shopping, health centres, open spaces, govt. and semi govt. establishments, etc.
Plans for Permanent Settlements at 72 locations prepared by TCPO have taken into account topography, socio-economic characteristics, forest resource, etc. and above all located above 3 m contour and beyond the maximum run up of Tsunami so as to minimize the impact of disaster.
MINISTRY OF URBAN DEVELOPMENT ROLE IN DISASTER MANAGEMENT

- For protecting the buildings against earthquake, the State Governments have to incorporate provisions of structural safety and Fire Protection and Safety Requirements in their respective Building Bye-laws.

- In order to sensitize the State Governments to take necessary action, Ministry of Urban Development have already circulated following documents for the State Governments to adopt provisions:

  - Earthquake tips prepared by IIT Kanpur have been circulated to all the State Governments and the same have been uploaded on the Ministry of Urban Development website.

  - Handbook on Seismic Retrofit of Buildings published by CPWD and IIT, Chennai has been circulated to the State Governments so as to adopt anti-seismic technology in all types of buildings.
Green Architecture Evolution

Prehistoric Architecture  Actual Architecture  Future Architecture

s p anchuri
Prehistoric Architecture

Ancient Greek Architecture

Ancient Egyptian Architecture

Ancient Roman Architecture
Middle Eastern Architecture
Local Architecture in Egypt

Nubian Architecture

Egyptian Architecture

Siwa Architecture

Islamic Architecture
Local Architecture in Egypt

Khedive Ismail Architecture in Egypt
(Downtown Cairo Architecture)

- Double high thermal mass walls
- High floor height
- Shutters
- Cross ventilation through courts
Contemporary Architecture

WHERE ARE WE NOW?
Contemporary Architecture

WHERE ARE WE NOW:

Are we supposed to building with the traditional means and the architecture of Hassan Fathy OR by high tech means.
Ecological systems

Natural
- Water cycle
- Carbon cycle
- Nitrogen cycle
- Phosphorous Cycle

Man-Made

Environmental Architecture
Environmental Architecture Systems

- Active Systems
  - Photovoltaic cells
  - Plate Solar Collector
  - Wind Turbines
  - Hydroelectric Power

- Passive Systems
  - Wind Catchers
  - Trombe Wall
  - Passive Solar energy
  - ...
Active Systems

Photovoltaic

Wind Turbines

Solar Water Heating
Passive Systems

- Wind Catchers
- Trombe Wall
Environmental Architecture

Ecological Architecture

Bioclimatic Architecture

Vernacular Architecture

Sustainable Architecture

Traditional / vernacular Architecture

Green Architecture

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What is Green Architecture?

“An architecture that meets the needs of present without compromising the ability of the future generations to meet their own needs”
<table>
<thead>
<tr>
<th>LEED India</th>
<th>CASBEE</th>
<th>Estidama</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Indian Flag" /></td>
<td><img src="image2" alt="Japanese Flag" /></td>
<td><img src="image3" alt="Emirati Flag" /></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>NAHB</th>
<th>BREEAM</th>
<th>GBCA</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image4" alt="American Flag" /></td>
<td><img src="image5" alt="British Flag" /></td>
<td><img src="image6" alt="Australian Flag" /></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>LEED</th>
<th>Green Globes</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image4" alt="American Flag" /></td>
<td><img src="image7" alt="American Flag" /></td>
</tr>
<tr>
<td>1. Energy and Atmosphere</td>
<td>2. Sustainable Sites</td>
</tr>
<tr>
<td>-------------------------</td>
<td>---------------------</td>
</tr>
<tr>
<td><img src="image" alt="Sun" /></td>
<td><img src="image" alt="House" /></td>
</tr>
<tr>
<td><img src="image" alt="Coffee Pot" /></td>
<td><img src="image" alt="Water" /></td>
</tr>
<tr>
<td><img src="image" alt="Earth" /></td>
<td><img src="image" alt="Cars" /></td>
</tr>
</tbody>
</table>
Green Building and Sustainable Architecture

• What is Sustainability?
• Sustainable Design
• Principles of Sustainability in Architecture
• Sustainable Building Life Cycle
• Pre-Building Phase
• Building Phase
• Post-Building Phase
• Preservation of Natural Conditions
• Human Comforts
• Types of Green and Sustainable Buildings
• Sustainable Remodeling
What is Sustainability?

Sustainability - Meeting the needs of the present without compromising the ability of future generations to meet their own needs.
Sustainable Design

Reduces the negative impact on the environment and human health, thus improving the performance during a building’s life cycle. Careful consideration is given to water, energy, building materials, and solid waste.
Principles of Sustainability in Architecture

• **Economy of Resources** - Reduce, recycle, and reuse natural resources

• **Life Cycle Design** - Structured methodology for the building process

• **Humane Design** - Harmony between humans and nature
Sustainable Building Life Cycle

- Pre-Building
- Building
- Post-Building
Pre-Building Phase

• Site selection, building design, and building material processes, up to but not including installation.

• Examine the environmental consequences of the structure’s design, orientation, impact on the landscape, and materials used.
Building Phase

• Construction and operation processes reduce the environmental impact of resource consumption
• Long-term health effects of the building environment on its occupants are considered
Post-Building Phase

Old materials become resources for other buildings or waste to be returned to nature. The sustainable design strategy focuses on reducing construction waste by recycling and reusing packaging and excess material.
Preservation of Natural Conditions

An architect should minimize the impact of a building on its local ecosystem (e.g., existing topography, plants, and wildlife).
Human Comforts

A building’s design should enhance the work and home environments. This can improve productivity, reduce stress, and positively affect health and well being.
Types of Green and Sustainable Buildings

- Homes
- Schools
- Commercial and public buildings
- Laboratories
- Health care facilities
Sustainable Remodeling

Existing buildings can remodel and install improved mechanical components and update operating systems to make a building green.
ENERGY CONSERVATION
BUILDING CODE
Amulya’s, Khammam
Bhooratnam’s, Bowenpally
CIPEL, Amaravathi
Alphamed Formulation P.Ltd. Shameerpet.
Balaji’s, Saidabad.
Sriram’s, Bangalore
Bachuwar’s Solapur
Explore the design elements and material specifications

s p anchuri
Mixed Use Tower, Amaravati
Anchuri’s, Kompally
ANCHURI & ANCHURI is a professional consulting firm that consists of architects, interior designers, engineers and construction managers. Alfa Pharma, Hyderabad was delivered in a construction management format incorporating sequentially tendered document packages. Given the project delivery format and the nature of our company’s organization, it’s fair to say that IDP occurred almost continually from project inception through completion.
The Lakshya College Building is in swastic form, it was a project with extraordinarily green ambitions. The program consists of lecture theatres, large teaching laboratories/teaching support, research laboratories, classrooms, graduate and faculty offices, administration and academic support, technical services, and cooperative education facilities. Elements such as, dual flush toilets, natural lighting with mandava logillu concept/court yard concept, and natural ventilation are being utilized to achieve sustainability.
JAMES BOND!

ARE YOU IN A PERFECT WORLD?
What is ECBC?


• Notification of ECBC in the combined State of Andhra Pradesh was done through amendment to G.O.M.S.168 i.e., G.O.M.S. 30 dt. 28.01.2014.

• Intent of the code is to set minimum energy performance levels for building design and construction.
Scope

• Commercial Buildings with plot area of 1000 sq.mts or built up area of 2000sq.mts
• Certain Commercial buildings such as multiplex, hospitals, hotels and convention centres have to follow ECBC, irrespective of Plot area or built-up area.
• Star rating system is provided for compliance (six star rating) based on ECBC compliance report on percentage of energy savings over base case.
• One Star (up to 5% energy savings over base case)
• Two Star (6%-10%)
• Three Star (11%-15%)
• Four Star (16%-20%)
• Five Star (21%-30%)
• Six Star (31% and above)
Components of ECBC

- Envelope
- HVAC
- Lighting
- Electrical Power
- Service Hot Water And pumping

Mandatory Requirements

- Prescriptive
  - Trade off option for Envelope only
  - Whole Building Method
# Prescriptive and Whole Building Performance

## Prescriptive Approach vs Whole Building Performance Approach

<table>
<thead>
<tr>
<th>Prescriptive Approach</th>
<th>Whole Building performance Approach</th>
</tr>
</thead>
<tbody>
<tr>
<td>Simple to understand and follow this approach</td>
<td>Needs technical and software knowledge to follow this approach</td>
</tr>
<tr>
<td>Needs less time for preparation of report</td>
<td>Needs more time for preparation of report</td>
</tr>
<tr>
<td>Less cost for preparation of report</td>
<td>More cost for preparation of report</td>
</tr>
<tr>
<td>More cost to be spent in the project with prescriptive method</td>
<td>Less cost to be spent in the project with WBP approach</td>
</tr>
<tr>
<td>Very rigid to follow</td>
<td>Very flexible to follow</td>
</tr>
<tr>
<td>More payback period and saves less money.</td>
<td>Less payback period and can save more money.</td>
</tr>
</tbody>
</table>
Third Party Assessor Framework

**Step 1a** - Designing of building by Architect and MEP consultant

**Step 1b** - Real Estate Developer approaches ECBC consultant for preparation of ECBC report.

**Step 2** - Real estate developer approaches TPA 1 with ECBC compliance report for ECBC Certificate and certificate will be issued by TPA1

**Step 3** - ECBC Certificate will be submitted with other building documents to GHMC for approval

**Step 4** - Construction of building in compliance with ECBC report

**Step 5a** - Real Estate Developer approaches ECBC consultant for preparation of ECBC compliance report.

**Step 5b** - TPA2 issues ECBC
ECBC CERTIFICATE FORMAT

TPA 1 - Issues certificate in Design Stage

TPA 2 - Issues certificate in Occupancy Stage
Key Takeaways

Sustainability will only become more important every year, as the effects of climate change are seen throughout the world. Whether it’s difficulty to get a specific material, or price changes due to rarity, it’s important for companies to look for different ways to construct buildings sustainably.

With the changes in governance currently happening in the country, climate change scientists are fearful that the benefits associated with sustainable construction might be overlooked with an increased emphasis on economic growth.

It is more important than ever that state governments take steps to incentivize sustainability in construction, and that firms look to grow and profit in an environmentally and socially responsible way.
IN A PERFECT WORLD...

THANK YOU
Thank You!