DESIGN 20 TEST REVIEW #1

Structure and Materials

1. Shell
   Single building material provides:
   structural support & outer covering.
   Common materials: brick, stone and wood
   (log cabin).
2. Skeleton & Skin
   Skeleton: Frame -- wood, iron, steel
   Skin: Lt. weight: wood, shingles, aluminum, glass
   Balloon Frame
   Early sarcastic term-- structure might blow away.

Post and lentil or post and beam. 4000 years old
Two upright posts and horizontal cross piece.
Posts carry weight to ground
Common materials: stone and wood

Materials Considerations
1. Compression Strength
Weight of entire building must be carried safely to ground.
2. Tensile Strength
Ability to span horizontal distance, with minimum support.
Tensile Strength: Steel best, then wood, then stone.

Iron Mid-19th century used for architecture
Weight and mass no longer dictated esthetics
Crystal Palace
First English skeleton and skin architecture.
Iron and glass.
Built for international arts exposition.
Eiffel Tower
Built to publicize Paris World Exposition.
A system of trusses.
Tallest man-made structure until Chrysler building.

Arch 2nd century B.C.E. Roman
Root of the word architecture .
Semi circle
Arch requires considerable side support to stand.
Incorporates complex forces:
Tension -- pulling apart
Compression pushing together
Advantages of arch:
permits opening of large spaces in a wall
covers long spans safely and economically
reduces amount of material used

Vault -- barrel vault or tunnel vault
Many arches placed flush, one behind the other.
Known as Romanesque architecture.
Many cathedrals constructed in this way.
Disadvantages of arch/vault:
Height is limited by width of arch
Weight & darkness -- visual and literal

Gothic Arch (pointed)
Advantages:
Weight is channeled down to the ground.
Vaults made with this type of arch can be taller.
Permitted addition of large windows.
Columns could be made thinner & more decorative.

Flying Buttress:
Ribs to support side of Gothic structures

Dome An arch rotated 360 degrees on axis.
Stresses like arch -- pushes outward
Requires exterior support

Truss (triangle)
Most resistant to stress.
Supports considerable load over a large span.

Cantilever
Beam supported at one end, unsupported at
opposite end.
Used when clear space is required below.
Steel or reinforced concrete

Suspension Architecture
One of the oldest engineering forms.
Cables support weight, strung from vertical pylons.
Road bed rises and falls (wind and traffic).
Advantages:
Economical, allows spans over water.
Early Problems:
Stability -- wind forces, storms, heavy snows
John Roebling
Masterpiece -- Brooklyn Bridge (1869-83)
Credit for solving early suspension structure problems.

Tacoma Narrows Bridge (Galloping Gertie)
Across Puget Sound, Washington.
Collapsed four months after opening.

Geodesic Dome 1947 Buckminster Fuller
Only structural support attributed to single person.
Series of triangular rods -- based on truss.
Not noted until '67 World's Fair
Advantages:
Economical
Lightweight material: glass, plastic, wood
Requires no interior support
Quickly assembled -- modular

Classical Architecture Greek and Roman architecture
Parthenon, Athens
Post & lintel construction. Doric style columns.
Refined version of this type of architecture.
Perfect proportions width to length.
Few straight lines:
Steps arch in middle.
Columns bulge in middle (entasis).
Facade is tilted back (slightly).
Corner columns thicker.
Pantheon, Rome
Use of dome.
No interior supports.
Oculus -- opening in center of dome for light.

Neoclassical or Classical Revival
Based on classical design
Classical details are ornamental, not structural.
Thomas Jefferson:
Virginia State Capitol
Univ. of Virginia, library rotunda
(modeled after Pantheon)
Monticello, Virginia Jefferson's home.

Arts and Crafts began England, mid 1800's
Reaction to poor quality designs of
Industrial Revolution.
Aim to make objects once again beautiful.
Greene and Greene (brothers)
Residential -- pioneered California bungalow.
Low-pitched roofs.
Broad, overhanging eaves for shade.
Extended rafters, decorative effect.
Sleeping porches.
Fine wood & joinery prominent.
Asian, primarily Japanese influences.

Art Nouveau 1895 (until WW I)
European centered: Spain, France, Germany, Italy
Hector Guimard -- Paris metro stations
Victor Horta -- Brussels

Continuation of Arts and Crafts
Materials:
metal castings, iron, glass, ceramic, concrete
Stylized forms: curvilinear, S shapes, sinuous
flowing lines and whiplash styles, plants, floral.

Victorian American period, late 1800's
Decorated box.
Arches, columns, and brackets
often decorative, rather than structural.
Mail order plans and architectural ornaments.
Largest U.S concentration: San Francisco
due to:
Most of city built second half of 1800's.
Long narrow lots (more space with height).

Art Deco Exposition of Decorative Arts, Paris 1925
American Deco examples:
Empire State Building
Chrysler Building, 1930
Financing -- success of automobile industry

Art Deco two styles:
1. Zig Zag 20's
Ornamentation: Repetitive patterns: chevrons,
sunbursts, zig zags, cubes & angles
Flourished in cities /skyscrapers.
Inspiration: Native American, Africa,
Materials: steel, bronze, glass, ebony, ivory chrome.
2. Streamline or Moderne 30's
Coincided with depression.
Less expensive materials and craftsmanship.
Abandoned ornamentation.
Smooth walls, rounded edges, circular windows.

Frank Lloyd Wright 1867 -1959
"Organic Architecture"
Buildings harmonize with environment.
Earthy colors, ornamental detail

Imperial Hotel Tokyo
Survived 1923 earth quake

Johnson Wax Racine Wisconsin
Wright's first significant use of curves.
Large open office plan.
Controversial:
Thin column supports -- mushroom shape

Guggenheim Museum - New York
Dedicated to abstract art
Materials: Coils of unadorned white concrete.
Open center space lighted by glass dome.
Idea of a continuous space --spiral ramp, 6 stories.

Marin County Civic Center
Wright's only work for government.
Integrates architecture, highway, and automobile.

Robie House
Most famous Prairie House.
Ribbon windows, gently sloping roofs.
Dominant horizontal lines.
Heavy-set chimneys and overhangs.
Designed outward from fireplace
Designed furniture for homes, even some dishes.
Generally two-story with single-story wings.
Rooms flow together in uninterrupted space

Wright (cont.)
Falling Water -- Kaufman House
Wright's most famous residential structure.
Cantilever construction anchored in rock.
Materials:
Vertical elements constructed of native stone.
Horizontal elements poured concrete.
Floors throughout paved in stone

Taliesin, Wisconsin
Wright's own home, burned twice.
Taliesin West Arizona.
Winter home for Wright & students.

Modern Architecture Later called International Style.
Design Characteristics:
Use of modern materials.
Importance of building not related to decoration.
Stripped of applied ornamentation
No historic reference
Rectilinear forms
Light color plain surfaces.
Open interior spaces -- visually weightless quality
Materials: Reinforced concrete, glass & steel.

Bauhaus 1919-33, Germany
Art and architecture school, with housing
Walter Gropius and Mies Van Der Rohe, directors
Birthplace of Modern Movement
Most influential design school.
Integration of art and technology.
1933 Nazis close school.

Walter Gropius Bauhaus director
Modern Architecture
Pioneer of steel frame in architecture
Prefabrication of parts and assembly on the site.
Interested in: economy & functionalism,
mass production.
Glass Curtain Wall

Bauhaus Dessau, Germany
Supporting structure (steel)
Skin (glass & stucco).

Fagus Shoe - First large building.

Pan American Building
Unpopular with public.
59 floors, blocks view down Park Avenue.
Reduced bulk by cutting the four corners.
Shape resembles wing (Pan American Airways.)

Mies Van Der Rohe 2nd Bauhaus Director
Less is more =
maximum effect from minimum use of form.
Exposed metal structure, glass curtain wall.
Used more highly finished materials than Gropius.

German Pavilion (aka Barcelona Pavilion):
International Exposition in Barcelona.
Materials: travertine, marble, chrome onyx & glass.

Farnsworth House
Open simple floor plan -- glass house.
Pure and weightless form.
Eight steel beams and two deck slabs.
Rectangular sheets of glass.
Expressed ideals of the Modern Style.

Mies (cont.)
Seagram's Building New York, Park Avenue
- Model for skyscrapers and corporate America.
- Steel frame, glass curtain wall.
- Large granite-paved plaza.
- Bronze exterior "columns"
- Collaboration with Philip Johnson

Le Corbusier (Corbu -- Charles Edward Jeanneret)
- Public considered his work too extreme.
- "House a machine for living."
- Reinforced concrete.
- Free-flowing designs with curves.
- Ribbon windows -- strips running from wall to wall

Villa Savoy, France
- One of the most famous Modern houses.
- Disliked by owners and left abandoned.
- Ground floor has a curved facade .

Unite de Habitation, Marseilles France
- Twelve-story apartment block for 1.600 people
- Alleviated severe postwar housing shortage.
- Concrete grid, slotted precast apartments.
- 23 different configurations
  - Double-height living rooms
  - Deep balconies

Ronchamp or Notre Dame de Haute Chapel.
- Away from machine look, more organic.
- Walls are pierced with irregular small openings: small on outside, widening on inside of thick walls
- Roof not supported by walls
  - (vertical supports inside walls)
- 4" space between roof and walls admits light
- Reinforced concrete& ruble of destroyed church which chapel replaced (WWII)

Bernard Maybeck
Bay Area Architect, faculty U.C. Berkeley
Favorite materials and techniques:
- native wood, hand-crafted details
- materials associated with factories:
- exposed concrete, factory windows

Important structures:
First Church of Christ, Berkeley
Palace of Fine Arts San Francisco (rebuilt in 60's)
- for Panama-Pacific Exposition (1915)
- Neoclassical Theme Roman ruin - Greek ornament

Lost many structures in 2 different fires (1923,1991)

Julia Morgan
Studied with Bernard Maybeck
First woman:
- enrolled in École des Beaux-Arts. Paris
- granted architect's license in California

Career advanced by: 1906 Earthquake & Hearst family
Important structures:
Berkeley Women's City Club
Many YWCA's
Hearst Estate at Wyntoon
St. John Presbyterians Church Berkeley
- craftsman style
- redwood, exposed beams and trusses

Hearst Castle San Simeon
- 28 years for completion
- Lavish & ostentatious residences
- Incorporated Hearst's collection of antiques, & art

John Lautner
- Apprenticed with Wright at Taliesin
- Organic Modernism
- "Un-buildable" sites
- Houses with vast clear span interiors
- Integrates water and the surrounding landscape
- Use of concrete

Chemosphere House (Malin House)
- 1960 Hollywood Hills
- 45 degree sloping lot
- A funicular
- Saucer-shape house on single column
- Subsidized by chemical companies

Elrod House
- Curves like Corbu
- Interior like Falling Water
- Existing rock formations built into home
- Glass wall in living room slides to expose exterior

Arango/Marbrisa House Acapulco
- Free-form shapes, reinforced concrete.
- Cantilever structure.
- Pool flows through house and over edge to Acapulco Bay.

IMAGES FROM GILBERT/ GETLEIN BOOK
Pont du Gard; Nimes, France; early 1st century C.E.
Pantheon; Built by Emperor Hadrian; Rome; 118-125 C.E.
The Crystal Palace; Joseph Paxton; London; 1851
The Eiffel Tower, Gustave Eiffel; Paris; 1889
U. S. Pavilion/geodesic dome; Fuller; Montreal; 1967
Notre-Dame Church Corbu; Ronchamp, France; 1950-55
Chrysler Building; William Van Alen; NYC; 1930
Falling Water; Frank Lloyd Wright; Bear Run, PA; 1936
Rotunda, University of Virginia; Jefferson; 1817-26