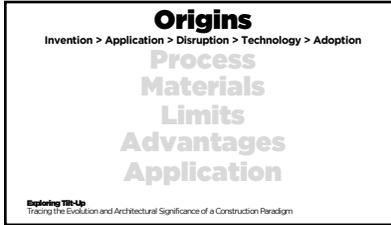
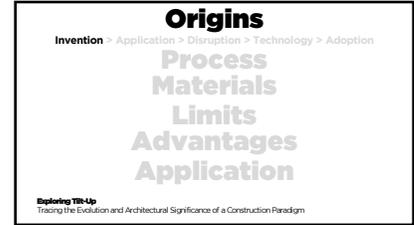




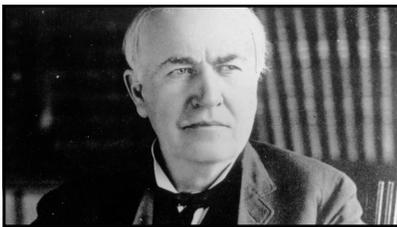
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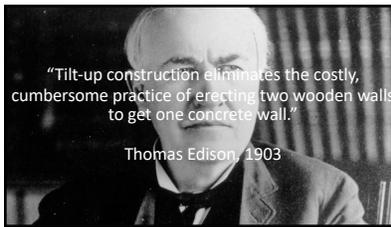
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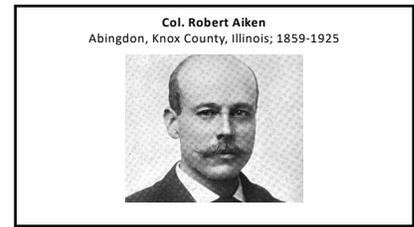
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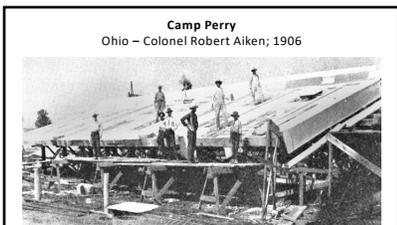
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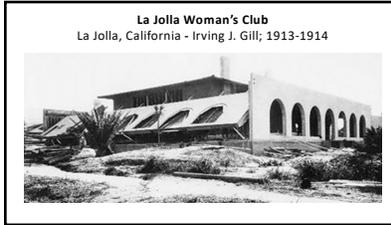


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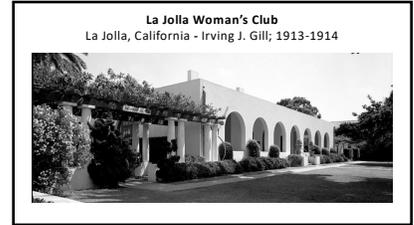
Irving John Gill  
Tully, New York; 1870-1936

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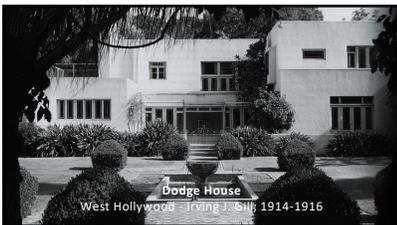
La Jolla Woman's Club  
La Jolla, California - Irving J. Gill; 1913-1914

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La Jolla Woman's Club  
La Jolla, California - Irving J. Gill; 1913-1914

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Dodge House  
West Hollywood - Irving J. Gill; 1914-1916

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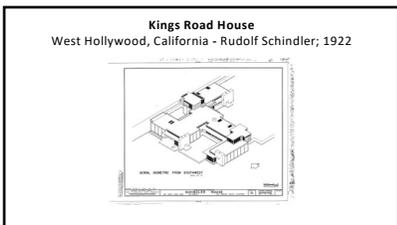
Start of World War I  
1914

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Kings Road House  
West Hollywood, California - Rudolf Schindler; 1922

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Kings Road House  
West Hollywood, California - Rudolf Schindler; 1922

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World War II  
Making propaganda posters, Port Washington, New York, 1942.

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End of World War II  
1945

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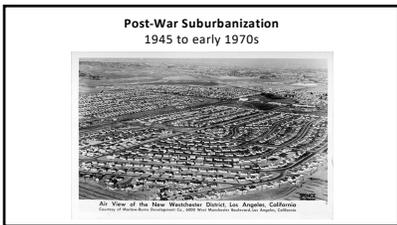
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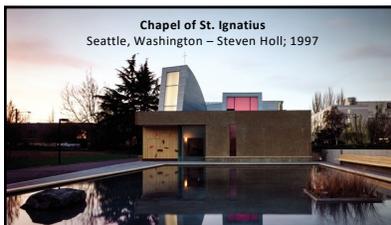
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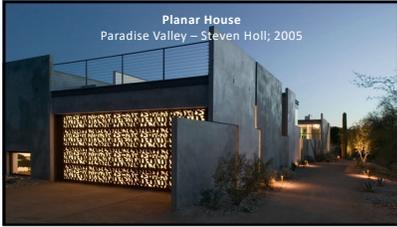
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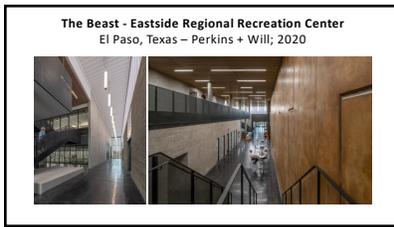
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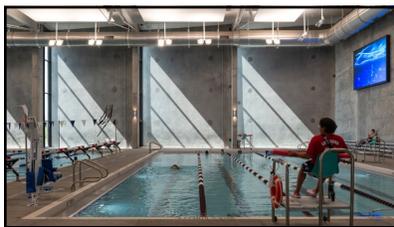
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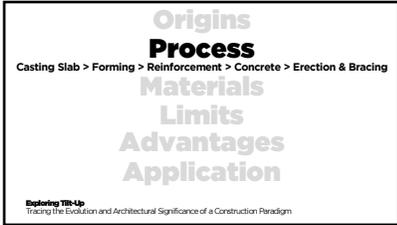
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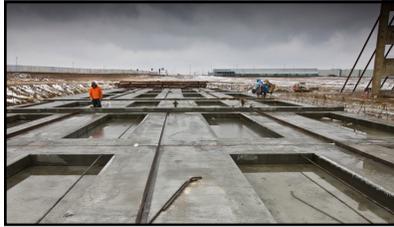
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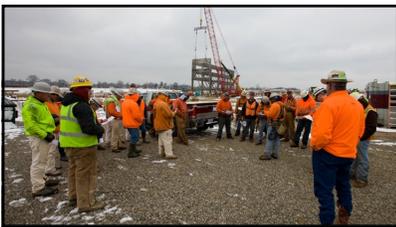
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**Origins**  
**Process**  
 Architects Influence on Construction  
**Materials**  
**Limits**  
**Advantages**  
**Application**

**Exploring Tilt-Up**  
 Tracing the Evolution and Architectural Significance of a Construction Paradigm

73

**Planning the Tilt-Up Building**

- Involve Entire Design Team
- Define Responsibilities
- Identify Key Factors
- Clarify Expectations

74

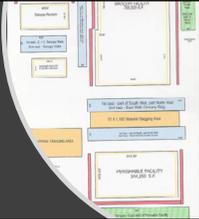


**Planning: The Site**  
 Overhead/Underground Obstructions

75

**Planning: The Site**

- Topography
- Access to Perimeter
- Material Storage/Staging
- Special Permits
- Noise/Dust Abatement
- Soil Stability



76

**Floor Slab**

**The Building Floor Slab**

- Most Common Casting Surface
- Hard Troweled Finish Recommended
- Most Panels Cast Face Down
- Use a Low Water-Cement Ratio
- 5" Minimum Recommended Thickness

77



**Planning: Casting and Erection**

78

**Alternative Casting Slabs**

- Staged Casting
- Up To 5'6" High
- Same Size or Smaller Panels on Top
- Plan Lifting Order



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**Planning: Casting and Erection Sequence**

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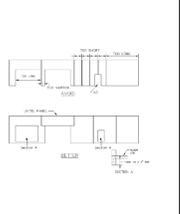
**Panelization**

Determine

- Shape
- Joint Location
- Weight (Cranes)

Involve

- Contractor
- Engineer of Record
- Architect



81

### Insulation Systems

**Sandwich Panel**

- Edge to Edge Insulation
- Eliminate Thermal Bridges
- Non-Conductive Connectors

82

### Insulation Systems

**TCA Composite Panel Research**

- Un-Interrupted Insulation
- Multiple Systems
- Unified Design Method
- Presentation during 2021 Tib-Up Convention
- Report Early 2022
- Design Guide 2025

83

## Origins Process Materials Concrete Limits Advantages Application

**Engineering Tib-Up**  
Tracking the Evolution and Architectural Significance of a Construction Paradigm

84

### Concrete

The most widely used material in the world after water.

85

### Concrete Building History

86

### Concrete Materials

**Components of Concrete**

- Partial of Concrete
- Large Aggregate
- Small Aggregate
- Filling Material
- Admixtures

87

### Blended Concrete

**Non-Cementitious Materials**

- Fly Ash & Other Pozzolans
- Granulated Blast-Furnace Slag
- Silica Fume
- Hydrated Lime

**Benefits of Blended Cement**

- Replace Part of Portland Cement (Cost Savings)
- Slight Alteration of Properties
- Use of Industrial Waste Products

88

### Concrete Admixtures

- Retarder - Slows Cure (Good in Hot Weather)
- Air Entrainment - Durability & Workability
- Water Reducers - Reduces w/c Ratio/Increases Slump
- Superplasticizers (SP) - Flowability
- Accelerators - Early Strength
- Coloring - Aesthetics
- Others - Corrosion Inhibitors, Shrinkage Reducers

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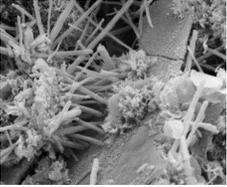
### Concrete Curing

- Time
- 75% in 7 Days
- Design Strength in 28 Days
- Moisture Present Extends Cure

90

**Why Concrete Hardens**

**Hydration** - Chemical Reaction Between Cement and Water.  
**Heat of Hydration** - Heat Given Off During the Chemical Reaction as the Cement Hydrates



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**Impact of Adding Water to Concrete**

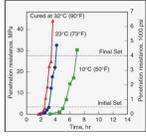
- +1 Gal H<sub>2</sub>O/CY Increases Slump 1 inch
- Lower Strength
- Higher Permeability
- Decreased Resistance to Weathering
- Poorer Bond Between Concrete and Reinforcement
- Increased Drying Shrinkage and Cracking
- Greater Volume Change from Wetting & Drying

92

**Concrete Curing**

**Temperature**

- Higher Temp = Faster Curing
- Protect Fresh Concrete Below 40 Degrees F until 5000 psi



93

**Origins  
Process  
Materials  
Limits  
Advantages  
Application**

Panel Width > Panel Height > Building Height > Building Size

Exploring Tilt-Up  
Tracing the Evolution and Architectural Significance of a Construction Paradigm

94



95

**Origins  
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Exploring Tilt-Up  
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96



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98

**Origins  
Process  
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Panel Width > Panel Height > Building Height > Building Size

Exploring Tilt-Up  
Tracing the Evolution and Architectural Significance of a Construction Paradigm

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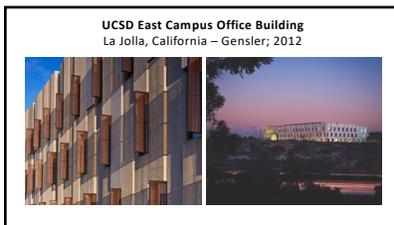
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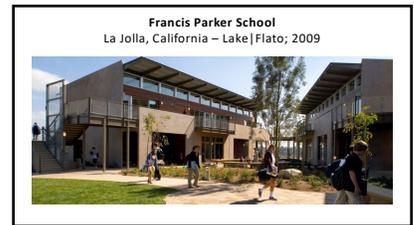
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**EGDE @ BRDG**  
 Saint Louis, Missouri – Lamar Johnson Collaborative; 2021

154



**Saint Louis Art Museum**  
 Saint Louis, Missouri – Cass Gilbert; 1904

155



**Saint Louis Art Museum**  
 Saint Louis, Missouri – David Chipperfield; 2013

156



**Kunstmuseum Liechtenstein**  
 Vaduz, Liechtenstein - 2000

157



**Saint Louis Art Museum**  
 Saint Louis, Missouri – David Chipperfield; 2013

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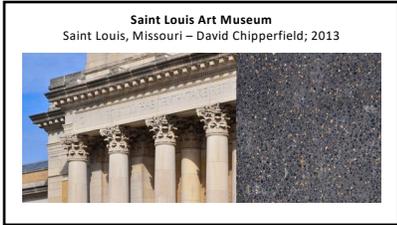
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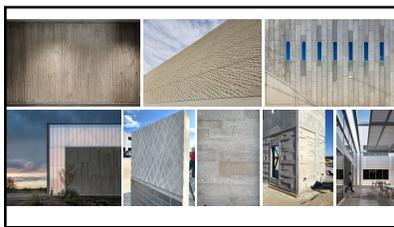
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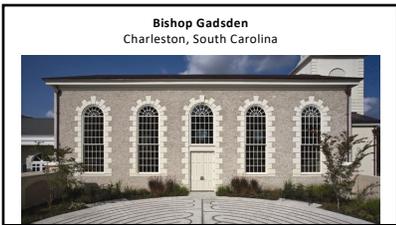
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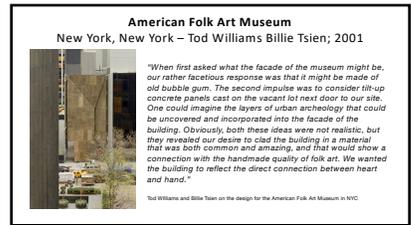
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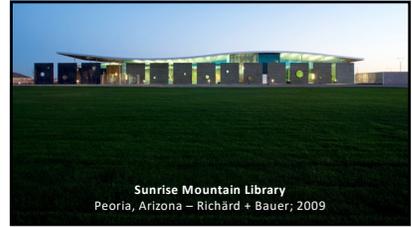
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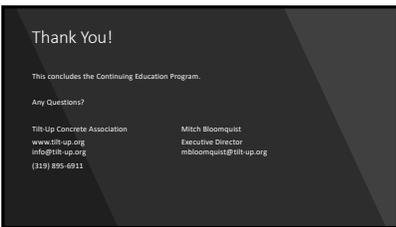
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