

ARCHITECTURAL STRUCTURES I:
STATICS AND STRENGTH OF MATERIALS

ENDS 231

DR. ANNE NICHOLS

FALL 2007

lecture
twenty eight



the semester
and beyond

Review 1
Lecture 28

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DESIGN CRITERIA	Light frame timber	Heavy-frame timber	Masonry bearing wall	Steel frame (hinge connections)	Steel frame (rigid connections)	Steel open-web joists	Steel space frame	Steel decking	Site-cast concrete: one-way slab	Site-cast concrete: two-way plate	Site-cast concrete: two-way slab	Site-cast concrete: one-way joists	Site-cast concrete: waffle slab	Precast concrete: solid slab	Precast concrete: hollow-core slab	Precast concrete: single tee	Precast concrete: double tee	RATIONALE
Exposed, fire-resistant construction																		Inherently fire-resistive construction
Irregular building form																		Simple, site-fabricated systems
Irregular column placement																		Systems without beams in roof or floors
Minimize floor thickness																		Precast-concrete systems without ribs
Allow for future renovations																		Short-span, one-way, easily modified
Permit construction in poor weather																		Quickly erected; avoid site-cast concrete
Minimize off-site fabrication time																		Easily formed or built on site
Minimize on-site erection time																		Highly prefabricated; modular components
Minimize low-rise construction time																		Lightweight, easily formed or prefabricated
Minimize medium-rise construction time																		Precast, site-cast concrete; steel frames
Minimize high-rise construction time																		Strong; prefabricated; lightweight
Minimize shear walls or diagonal bracing																		Capable of forming rigid joints
Minimize dead load on foundations																		Lightweight, short-span systems
Minimize damage due to foundation settlement																		Systems without rigid joints
Minimize the number of separate trades on job																		Multipurpose components
Provide concealed space for mech. services																		Systems that inherently provide voids
Minimize the number of supports																		Two-way, long-span systems
Long spans																		Long-span systems

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Office Hours

Professor Anne Nichols (845-6540)

Fall 2007

	December 5 (Wednesday)	December 6 (Thursday)	December 7 (Friday)	December 8 (Monday)	December 9 (Tuesday)
8 am					
9 am					
10 am		office hours		office hours	office hours
11 am					
12 pm					
1 pm	office hours		office hours	exam	exam
2 pm					
3 pm					
4 pm					

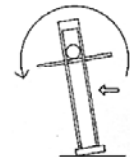
Review 2
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Structural Design Criteria

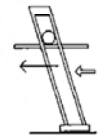
- components stay together
- structure acts as whole to be stable
 - resist sliding
 - resist overturning
 - resist twisting and distortion
- internal stability
 - interconnectedness
- strength & stiffness



Overturning: wind or earthquake



Twisting



Lateral racking

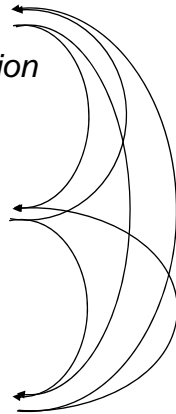
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Structural Design Sequences

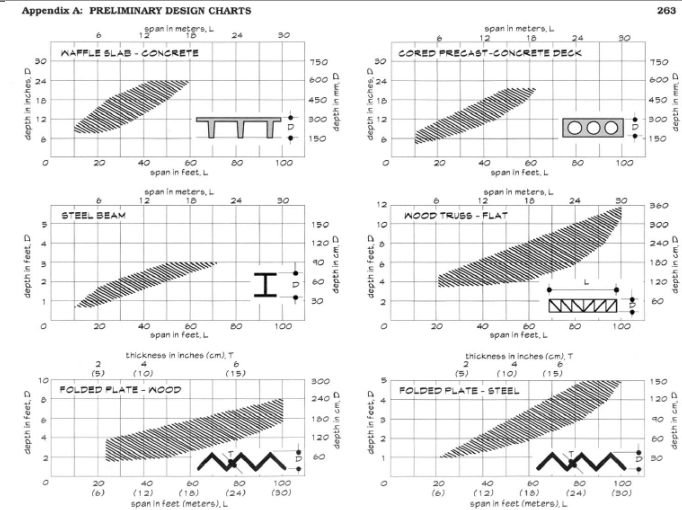
- *first-order design*
 - structural type and organization
 - design intent
 - contextual or programmatic
- *second-order*
 - structural strategies
 - material choice
 - structural systems
- *third-order*
 - member shaping & sizing



Final Exam Material

- *my list:*
 - equilibrium - ΣF & ΣM
 - supports, trusses, cables, beams, pinned frames
 - materials
 - strain & stress (E), temperature, constraints
 - beams
 - distributed loads, tributary width, V & M , stresses, design, section properties (I & S), pitch, deflection

Component Design Guides



Final Exam Material

- *my list (cont'd):*
 - columns
 - stresses, design, section properties (I & r)
 - frames
 - P , V & M , P - Δ , connection design, tension member design
 - design
 - ASD
 - LRFD
 - wood peculiarities

