

**ARCHITECTURAL STRUCTURES I:
STATICS AND STRENGTH OF MATERIALS**

ENDS 231

DR. ANNE NICHOLS





SPRING 2008

**lecture
twenty eight**



**the semester
and beyond**

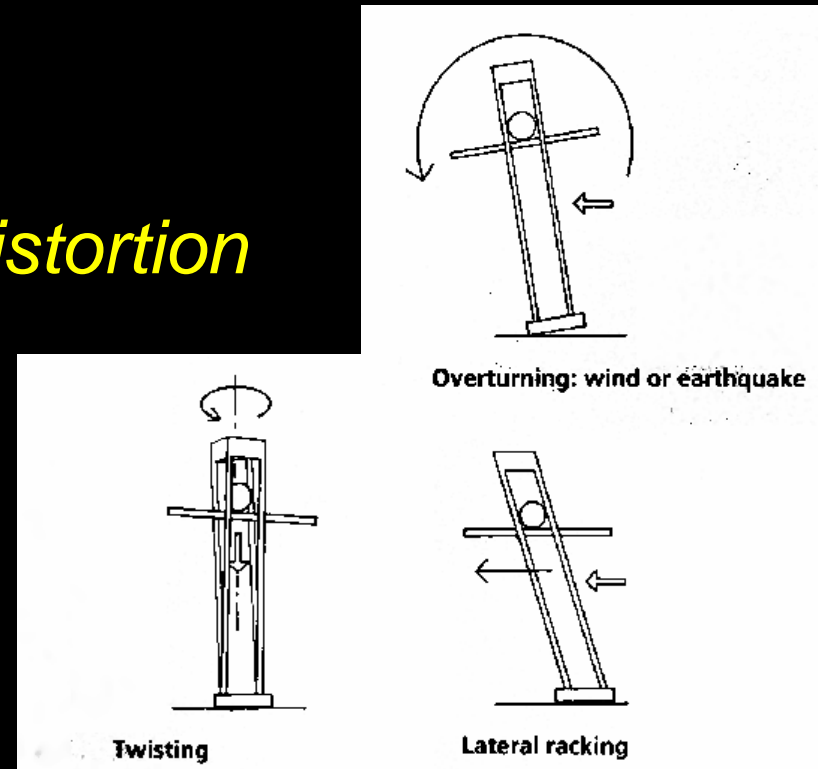
Office Hours

Professor Anne Nichols (845-6540)			Spring 2008		
	April 30 (Wednesday)	May 1 (Thursday)	May 2 (Friday)	May 5 (Monday)	May 6 (Tuesday)
8 am					
9 am					
10 am	<i>office hours</i>	<i>office hours</i>	<i>office hours</i>	<i>office hours</i>	<i>office hours</i>
11 am					
12 pm					
1 pm			<i>office hours</i>	<i>exam</i>	<i>exam</i>
2 pm					
3 pm					
4 pm			<i>exam</i>	<i>office hours</i>	

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-resiant 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

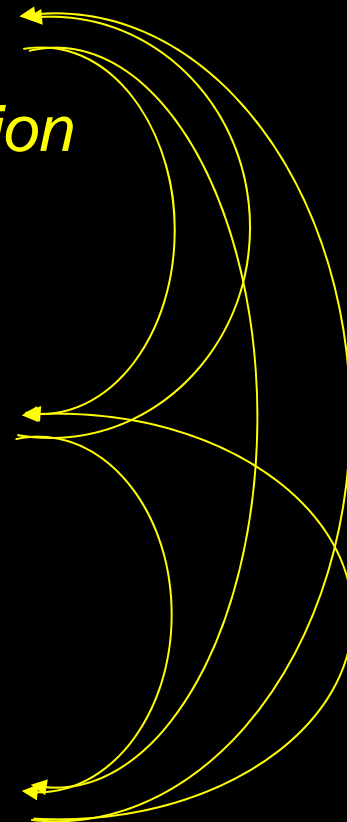
Structural Design Criteria

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



Structural Design Sequences

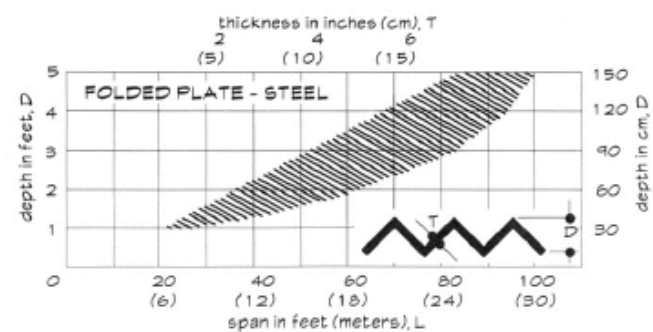
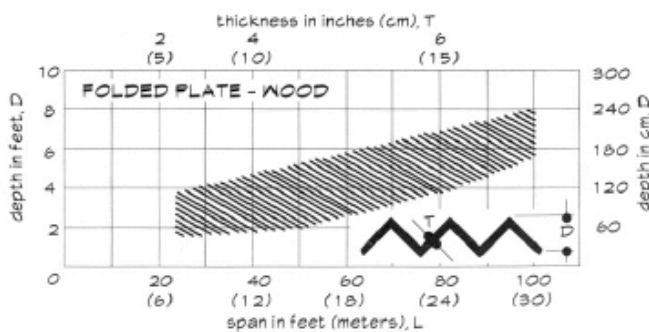
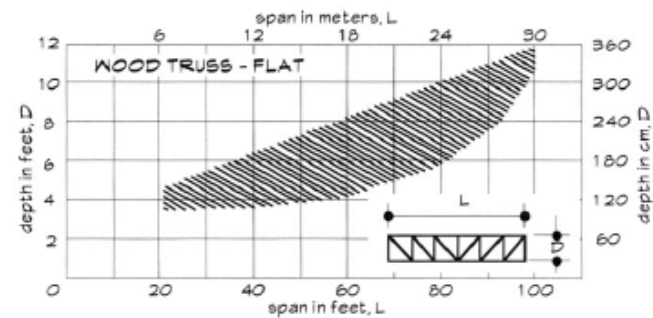
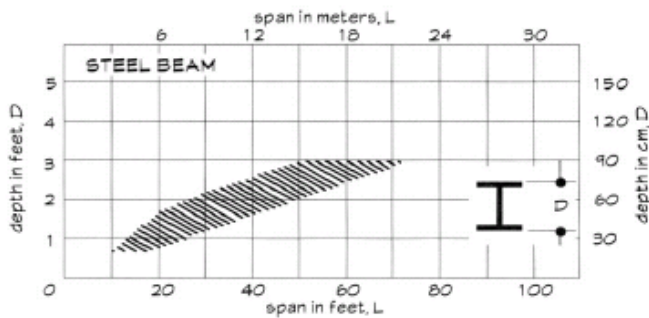
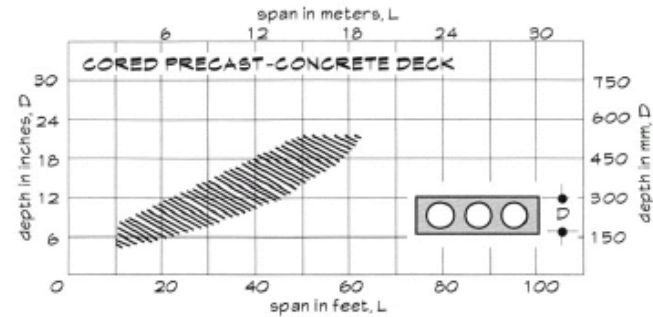
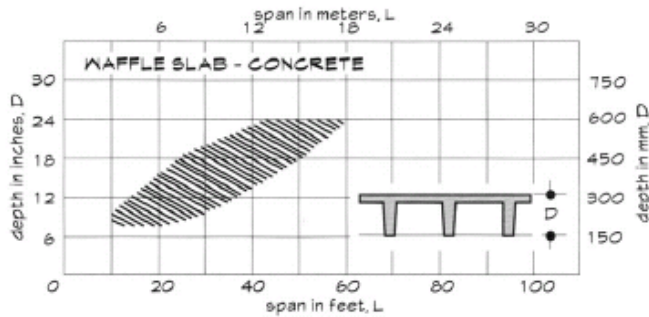
- *first-order design*
 - *structural type and organization*
 - *design intent*
 - *contextual or programmatic*
- *second-order*
 - *structural strategies*
 - *material choice*
 - *structural systems*
- *third-order*
 - *member shaping & sizing*



Component Design Guides

Appendix A: PRELIMINARY DESIGN CHARTS

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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*

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*